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Building the Salt Springs Rock-Fill Dam in California

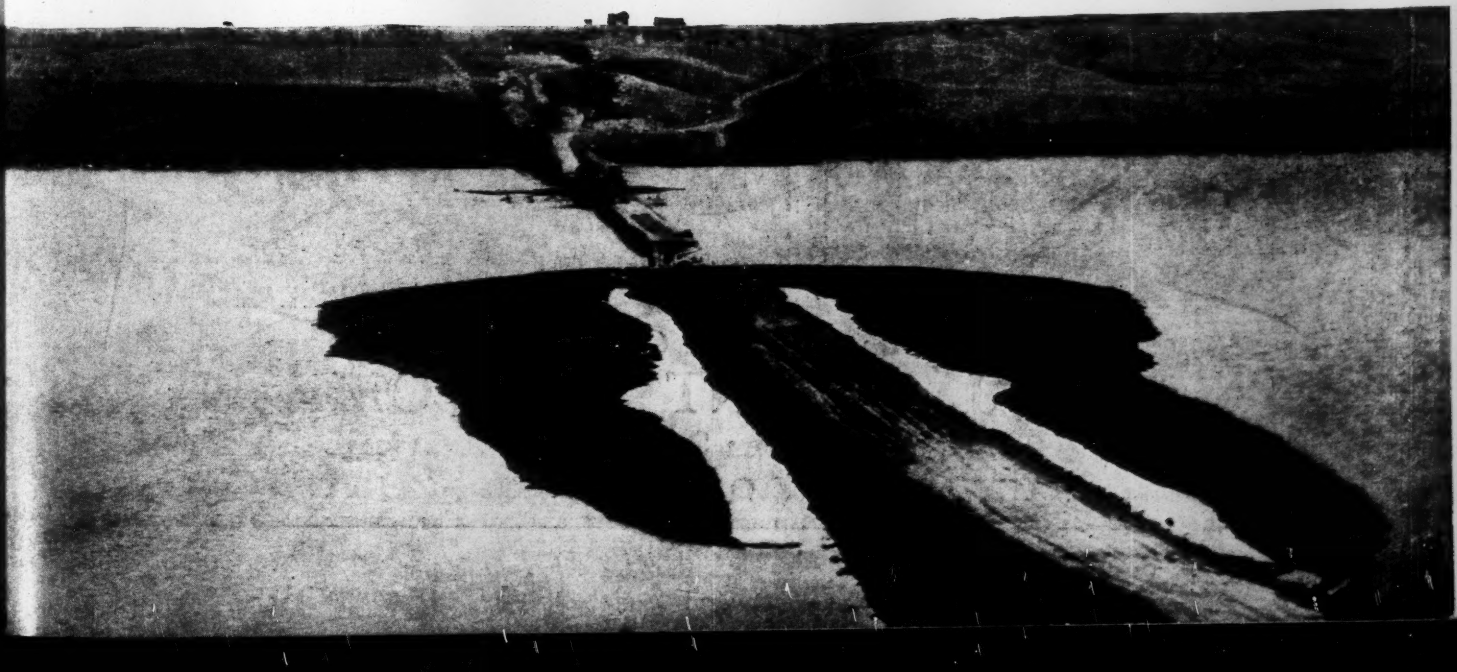
Making Highway Fill Across a Muck-Bottom Lake

Measuring the Glacial Flow on Mount Hood

Concrete Airship Hangar at Seville, Spain

Guy-Derrick Erection of Steel Bridges

Island of lake-bottom muck created by weight of North Dakota highway fill



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Contents for August 28, 1930

VOLUME 105, NUMBER 9

Copyright, 1930, by McGraw-Hill Publishing Company, Inc.

Guy-Derrick Erection of Steel Bridges and Viaducts.......... 318

Concrete Air-ship Hangar of Bold Design in Spain.......... 324
BY A. A. PETERS

Measuring Rate of Glacial Flow on Mount Hood, Ore. 326
BY EARL A. MARSHALL

Difficult Work on Highway Fill in Muck-Bottom Lake...... 329

Retaining Wall Costs Compared.......................... 331

Construction Methods on the Salt Springs Rockfill Dam...... 332

Quick-Hardening Cement Simplifies Detour Problem........ 336

Loading Heavy Levee Machines for Barge Transportation.... 337
BY J. C. FRENCH

Advantages of Sectional Dredges for Mississippi Levees...... 338
BY V. J. MILKOWSKI

Editorial....315 Job and Office....340 Letters....342

News....343 Equipment....349 Unit Prices....351

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DEVOTED TO CIVIL ENGINEERING AND CONTRACTING

F. E. SCHMITT, *Editor*

Volume 105 NEW YORK, AUGUST 28, 1930 Number 9

A Plan That Failed

APPROACH of the 1930 census stimulated many cities to attempt to raise their population rank by taking in neighboring areas, a well-known method. A novel variant tried by Atlanta has now proved futile. Annexation or consolidation plans there having encountered numerous snags more or less common to such attempts, rival factions were pacified and, as was thought, the main end achieved by a legislative act creating a Greater Atlanta in name but with none of the usual powers of a city. As might have been foreseen, this easy way of surpassing rivals in population met with protest to the Census Bureau from other cities of the South. After apparent temporizing, the Census Bureau has announced that Atlanta borough, as it is now called, instead of Greater Atlanta, will be given place in the 1930 census. Any other course would be absurd. In the long run, the ruling will be to the advantage of Atlanta and of other cities as well. Mere population juggling serves no useful purpose and can only confuse the records.

Encouraging New Methods

GENERAL BROWN'S indorsement of the promising possibilities of hydraulic-dredge levee construction is gratifying. It checks the conclusions reached by *Engineering News-Record* in its study of the present operations along the Mississippi River and gives encouragement to those contractors who are willing to risk their dollars in working out the special problems of the hydraulic method in this field. Openminded support of the initiative of contractors in applying progressive methods to their work is one of the best contributions the army engineers can make to the success of their construction operations. In the past such support was by no means always given, and a tendency grew up in some of the government work to prefer conventional methods and often to discourage the contractor's ingenuity by the way in which the specifications and construction program were drawn. With the attitude reflected in General Brown's letter on another page, a distinctly favorable construction atmosphere can develop.

Quicker Results

QUICKER construction is demanded by so many present-day considerations that both new tools and new procedure for saving time acquire special value. The advance planning and careful co-ordination of field procedure by which great office buildings recently have been completed in unprecedentedly short periods of time involve only insignificant extra costs compared with the returns in the form of earlier rentals. Speed in road construction can pay similar dividends; herein lies the importance of the results obtained through use of early-strength cement as reported in this issue. If most of the trouble and cost of detouring can be saved, an economy of real magnitude is achieved. Interruption of road service is more costly than is often realized, for those costs which fall on the road user are real and large, even though they are widely distributed. Such costs warrant an extra element of construction expenditure for their elimination. Similar reasoning applies to many other branches of present-day construction. It may not always be possible to compute the value of speed as closely as in road and office-building construction, but at least a fair approximation is usually feasible. As year by year the money value of time saved grows larger, the cost and value of speed are worth study in connection with every construction enterprise.

Public Nuisances

ACCORDING to the doctrine that everything, even the mosquito, serves some useful purpose, there should be a hidden virtue in airplane endurance flights. But from a technical point of view this virtue is incapable of being perceived. Both human and engine endurance can be demonstrated more effectively by other means. Nothing is accomplished by three- or four-week non-stop flights beyond adding to the numerous public nuisances which already afflict the world. Their records have no meaning related to the efficiency of air transportation, nor do they tend to build up public faith in it. It does not seem possible that the aviation industry hopes to lift itself out of its present depression by the peculiar notoriety of its endurance flights. On the contrary, they do the industry harm by creating the belief that airports are undesirable city neighbors and should be confined to remote regions where nuisance flying will be least objectionable. And this, in turn, may hamper the best development of air transport in the future. To bring flying to the same level of interest as marathon dancing and flagpole sitting is in no way constructive.

Not for the Farmer

ACCELERATED road construction, which the government last week announced as a drought-relief measure intended to give the farmer employment off the farm, now turns out to be no drought relief at all but a measure to aid general business and employment. It is remarkable that the President should have allowed so grave a misconception to arise. The $121,000,000 advance money has been allocated to all the states, without regard to drought. Under the law it cannot be used on local roads, which offer the only real opportunity to utilize farm labor. Accelerating the construction of main roads of the federal system may tend to work against farm relief rather than for it, since the states in order to co-operate as the law requires will have to make unscheduled increases in their contributory payments and therefore curtail the funds for local roads. But as many states have not even taken up all their

1930 allotment of federal aid—for lack of money and tax-reduction demands—the acceleration project may prove to be largely an empty gesture even as regards general unemployment relief. However, if some quick means can be found to abolish or defer state contributions for next year, the plan can become a constructive factor in improving business and employment, less through the amount of money involved than through the stimulation of courageous business sentiment.

Fills on Muck Bottoms

MUCK BOTTOMS in swamplands and lakes present a baffling problem for the highway or railway engineer who must build substantial fills across them. Railway men have grappled with the problem for years; to the highway man it is among the newer problems brought in by demand for more direct routes, and by the increasing load which highways must carry. The difficulties involved in the building of one such fill and the methods used in overcoming them, as described this week, are typical of such work, and yet cannot be taken as a criterion of what may be found in similar work, because no two muck bottoms appear to respond in the same way to similar treatment. Railroad men learned this when they began to replace their low fills "floated" on cross-logging over the muskegs so characteristic of a considerable portion of our northern states and part of Canada. In some instances the fills were made without a great deal of difficulty, the new material settling down into the muck uniformly and raising up the muck at either side of the fill. In others, thousands of yards of filling material in excess of the estimated requirements and many bents of temporary trestles have gone into the most innocent-looking places before a stable fill has been established. Not infrequently embankments have been built up to grade without trouble, only to disappear overnight, leaving a worse looking place to fill than was first encountered. Here is a field where highway engineers may learn from the experience of railway engineers, especially the older men who went through the period of rebuilding railroads to meet modern demands.

Bridge-Erection Tools

STEEL bridge erection is traditionally a job for specialized equipment. The gantry traveler and the derrick car long held sway. Later the locomotive crane was tried and proved its value. For years such traveling units were as characteristic of a bridge job as were the floor system and swaybracing. But the weight and cost of these tools were serious disadvantages at all times. The cost of a traveler built for a particular bridge must be added to that of the bridge itself, and when the bridge members must be increased in size to carry the traveler there is a further item of cost. Other special bridge-erection tools, though not built for merely one bridge, yet involve a serious equipment charge. The value of light, general-purpose tools for bridge erection is obvious and therefore the successful use of guy derricks on several bridges, as described in this issue, is an important innovation. Its success may turn out to have bearing on the possibility of standardizing bridge erection equipment. About a year ago the construction division of the American Society of Civil Engineers, which has a number of committees studying construction plant and methods, attempted to organize a committee on steel bridges, but had to abandon the attempt when several bridge erectors declared that steel bridge erection is too specialized to permit of general conclusions on equipment and methods. Guy derricks—whether or not they succeed in taking the place of special equipment—are a step in the right direction, for standard equipment should aid in lowering cost and increasing the speed of erection.

Railroad Track Economics

IS OUR present railroad track construction adequate and economical for modern traffic conditions: high speeds, heavy trains and heavy wheel loads? The desirability of improvement has been suggested frequently, although more often as a recommendation for some new appliance than as a problem in railway engineering. But the question is raised anew by trials of certain track details originally developed in Europe, and also by some features of a recent report on railroad track studies.

First-class track, in universal American practice, consists of heavy T-rails on metal tie-plates, spiked to treated wood ties laid in an ample bed of stone or clean gravel ballast. One of its weak spots is the driven spike, whose hold upon the rail is due only to the friction between the wood and the spike. This fastening is undoubtedly a source of much work and expense in maintenance, since the spikes require continual tightening, which has an injurious effect upon the wood and causes more frequent renewal of spikes and ties.

The trial track mentioned above was described recently in these pages. In it the rails rest on large double-shoulder tie-plates which are secured to the ties by screw spikes, the rails being bolted to lugs on the plates. At the joints the rails are seated on long base plates similar to the tie-plates, and are spliced in the usual way. In American practice, tie-plates are common, but usually have only one shoulder; independent fastenings for the tie-plates are sometimes used; screw spikes are used to some extent, and base support of rail joints is not unusual.

What distinctive features, then, has the foreign track? Its one outstanding feature is a rail fastening which has a positive hold, does not penetrate the wood tie and is independent of the tie-plate fastenings. Through bolts in wood ties have been tried experimentally, but make a somewhat awkward fastening. Short and heavy bolts attaching the rail directly to the tie-plate, as in the trial track mentioned, may present some advantages, provided: (1) that the tie-plate is rigid enough not to bend under the action of the rail, and (2) that the plate is so firmly fastened as to become an integral part of the tie rather than a loose wearing piece.

Reverting to the question of typical American track construction, the latest report of the joint committee of the American Railway Engineering Association and the American Society of Civil Engineers on stresses in railroad track states that tracks considered to be of first-class construction possess deficiencies not generally realized. For example, the rails are not rigidly connected to each other or to the ties, and have no uniform bearing upon the latter; the ties have an extremely variable support in the ballast; the ballast is subject to settlement, crushing and displacement, and the roadbed has no uniformity of bearing capacity.

All this, be it remembered, relates to good and ordinarily well-maintained main tracks. On such track the unloaded rails bear generally on only about five ties in a rail length, according to the report. That is to say, of seventeen to twenty ties under a 33-ft. rail only five give actual direct contact or support. On the other ties there is a play of 0.05 to 0.10 in. between rail and tie. Variations affecting the condition of rail support are noted as follows: (1) uneven play between rail and tie, (2) uneven bearing upon the tie, (3) uneven size and straightness of ties, (4) irregular spacing of ties, (5) uneven bearing of ties in the ballast, (6) uneven stiffness in ballast bed because of variations in tamping, (7) insufficient depth of ballast to carry and distribute the load. The report suggests the advisability of finding "what practicable means can be used to secure more uniform rail support, more even track stiffness and more lasting track surface."

Again, there are serious and specific defects in rail joints: (1) loose fit of splice bars, (2) vertical movement of joints, (3) poor fit of tight bolts, (4) loose bolts, (5) variable spacing of joint ties, (6) insufficient lateral strength, (7) joints universally of less strength and stiffness than the solid rails. Through these shortcomings the joint contributes largely to expenditures of labor for track maintenance.

As an offset to the unfavorable conditions which exist even in good track, the report calls attention to the value of a deep and consolidated bed of ballast, since tests indicate that it acts as a beam and distributes the pressures longitudinally. This is a matter which should be considered seriously as a simple means of track improvement, since even main-line tracks often show an inferior quality and inadequate quantity of ballast. In fact, it is probably that in many cases a heavy bed of good ballast will be a better improvement than laying heavier rails.

It is generally assumed that heavier rails will improve the track and reduce maintenance, but as to this point the report above mentioned says: "While the heavier rail distributes the loads over a greater number of ties in front of and behind a group of wheels (not affecting to any great extent the pressures on the ties within this group of wheels), the increased stiffness of rail tends to increase the variation in load placed on individual ties." Thus, although the heavier rails improve some defective conditions, they may serve also to aggravate other such conditions. On the other hand, a point of value in increased stiffness of heavy rails, relating to train resistance, is noted by a recent committee report of the American Railway Engineering Association. In tests with 100-lb. and 130-lb. rails, a marked reduction in resistance was found on the heavier rails.

It has been argued that there are advantages in the English track, with rails of dumbbell section wedged in cast-iron chairs spiked or bolted to the ties. But although this system is practically universal in England, where loads are much lighter than on American railways, it is obsolete in the few other countries which have tried it. The double-head rail section may have some advantage in manufacture, but the heaviest of such rails are lighter than many rails used in American track construction. As to the chairs, a large proportion of the metal is dead weight, being required to hold the rail in place without helping to distribute the load on the tie. The wedges which are driven between the rail web and the side of chair are no more positive or more permanently secure as fastenings than are spikes, as the wedges work loose and require continual attention.

An obvious question is whether there is prospect or probability of improvement by some entirely new type of track. The answer must be in the negative, since few such designs have been put to the test of service. Excluding bridge and station decks, the only attempts at departures from the universal type have been limited trials with concrete roadbed to supersede ties and ballast. Some of these have been failures, and although recent trial on the Pere Marquette Railway is said to promise good results, its quarter of a mile of experimental track is far too limited to warrant conclusions as to either efficiency or ultimate economy. And certainly there are few indications of further construction of such experimental track designs.

From the foregoing it is apparent that railroad track of the present day, when well built and well maintained, is a reasonably efficient and safe structure. Radical changes in design, therefore, are not to be looked for. Those which have been made have not brought sufficient improvement to warrant their adoption. Improvement is needed in degree or detail rather than in type. It is here that railroad track opens up an opportunity for study to increase its efficiency as a unit in our modern transportation system.

Engineers Study Ice Flow

NEW methods of transportation and communication are making the world smaller. The far-flung trails of yesterday's adventurers become the routes to be followed tomorrow by the scouts of industrial enterprises. Glacier-covered wastes are not nearly so far beyond our horizon as they were a generation ago, and correspondingly greater interest attaches to facts about glacial flow, or, perhaps, to the *mysteries* of glacial flow.

The research committee of a mountaineering organization in Oregon has patiently compiled data over a five-year period on the movement of a typical ice stream on the slope of Mount Hood. Interesting discoveries have been made. For example, the committee's study has shown that a depth of 20 or 30 ft. of ice often melts or evaporates from the surface of this glacier during one summer season without any corresponding change in actual surface elevation. Contrary to prevalent belief, the investigators find the glacier moving almost as fast in winter as in summer. They have encountered many more prospects for research on the subject than available funds will cover. For example, only surface flow has been measured, but the possibility is recognized that the flow on the bottom may be very different. The need for some determination of friction on the bottom and sides of the ice stream as well as internal friction is apparent from the fact that the surface ice travels much faster at the center than at the sides of the stream. Gravity pressure and other forces combine to give a complex cause for ice movement. Like streams of water, ice streams may have countercurrents, as shown by the observation that at some points surface ice, at least, travels upstream.

Does ice flow result from successive melting and freezing; is it a movement of the crystals one over the other, or is there some basis of fact in the European theory (which appears to some members of this committee as "antiquated") that ice flow is a succession of cracking and closing of cracks? The fundamental principles involved in ice movement need clarification and the whole subject should have further study. The five years' work of the Mazama research committee has established some data of real value, but if and when funds can be provided for extending the scope of the investigation much more light will be thrown on fundamentals of ice flow now shrouded in mystery.

Guy-Derrick Erection of Steel Bridges and Viaducts

Long Cantilever Structure at Louisville Erected in Record Time as Were Deck-Truss and Deck-Girder Structures on New Line of Pittsburgh & West Virginia Railway—Lightness, Low Cost, and Ability to Start Job at Any Pier Advantages over Erection-Traveler Method

WITHIN the past two years a method of adapting the ordinary guy derrick to steel-bridge erection has been so far perfected that two long cantilever structures, a deck-truss bridge and several deck-girder bridges have been successfully erected by this equipment.

The guy-derrick system of erection embodies several important features. When steel shipments can be made by water, direct from the fabricating shop to the bridge site, erection can begin with the guy derrick placed on one of the river piers; this is advantageous since the river piers are often built before those on shore in order to take advantage of spring and summer weather. Also on a new highway or railway location it is sometimes specified that bridges and viaducts be erected before the grade reaches the site; the guy derrick can be hoisted to the top of any pier and begin erecting steel. Other advantages of the guy derrick center around its elimination of the conventional traveler, which is usually a costly, special and heavy piece of equipment. Guy derricks are very light in proportion to their capacity and necessitate no reinforcement of bridge members to carry them. In many instances the weight of the guy-derrick rig may be reduced to a minimum by placing its power plant at the foot of one of the piers either in a barge or on the ground. This lightness is particularly useful when erecting heavy cantilever bridges and points to the possibility of eliminating the practice of floating the suspended spans to the bridge and lifting them into place. In addition to these advantages the guy derrick is a standard piece of erection equipment which can be used without alteration on almost any type of structure.

History—So far as this present method of bridge erection by guy derricks is concerned, it began during the construction of the Point Pleasant, W. Va., bridge across the Ohio River, an eyebar-chain suspension structure completed in 1928. Steel was shipped by barge to the site and the main towers were erected with guy derricks which were first mounted on the piers and then jumped up the tower as erection progressed.

Following this, the method was extended to use on the new Louisville highway bridge, a through cantilever structure over the Ohio River. On this bridge the guy derricks, after erecting the towers over the main piers in a manner similar to that used at Point Pleasant, were dropped down to the bridge deck, mounted on small four-wheeled railway trucks and operated as travelers, erecting the span steelwork. More recently, guy derricks have erected another cantilever structure across the Ohio at Rochester, Pa., outside of Pittsburgh, and early this year they were adapted to the erection of a deck-truss crossing of the Monongahela River at Belle Vernon, Pa., on the new line of the Pittsburgh & West Virginia Railway. Several deck-girder bridges on this same line have also been erected with guy derricks.

In the present article, for purposes of description, the erection of the Louisville bridge will be described, inasmuch as it is the largest structure so far constructed with guy derricks, and the project upon which the method was really developed. Consideration will also be given to the erection of the railway deck structures of the P. & W. Va. Railway Co.

The Louisville bridge is a toll highway structure connecting Louisville, Ky., with Jeffersonville, Ind. It is

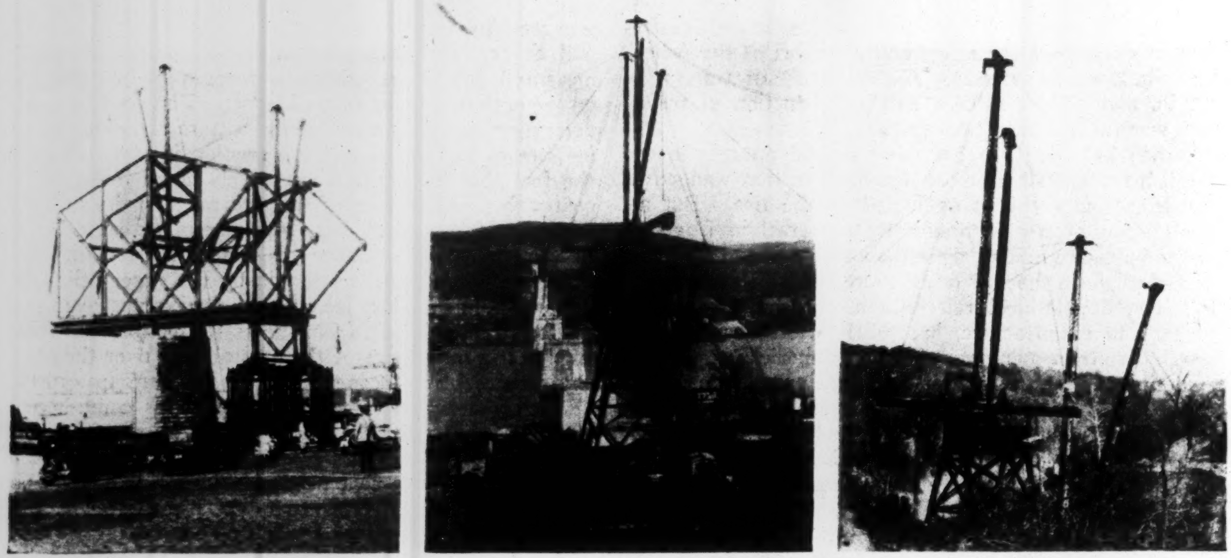


FIG. 1—GUY-DERRICK ERECTION APPLIED TO THREE TYPES OF BRIDGES
Left: A portion of the through cantilever across the Ohio at Louisville, Ky. Center: Starting work on the P. & W. Va. Railway's deck-truss crossing of the Monongahela River at Belle Vernon, Pa. Right: First steel erected on a deck-girder viaduct on the new line of the P. & W. Va. Railway Co. out of Pittsburgh.

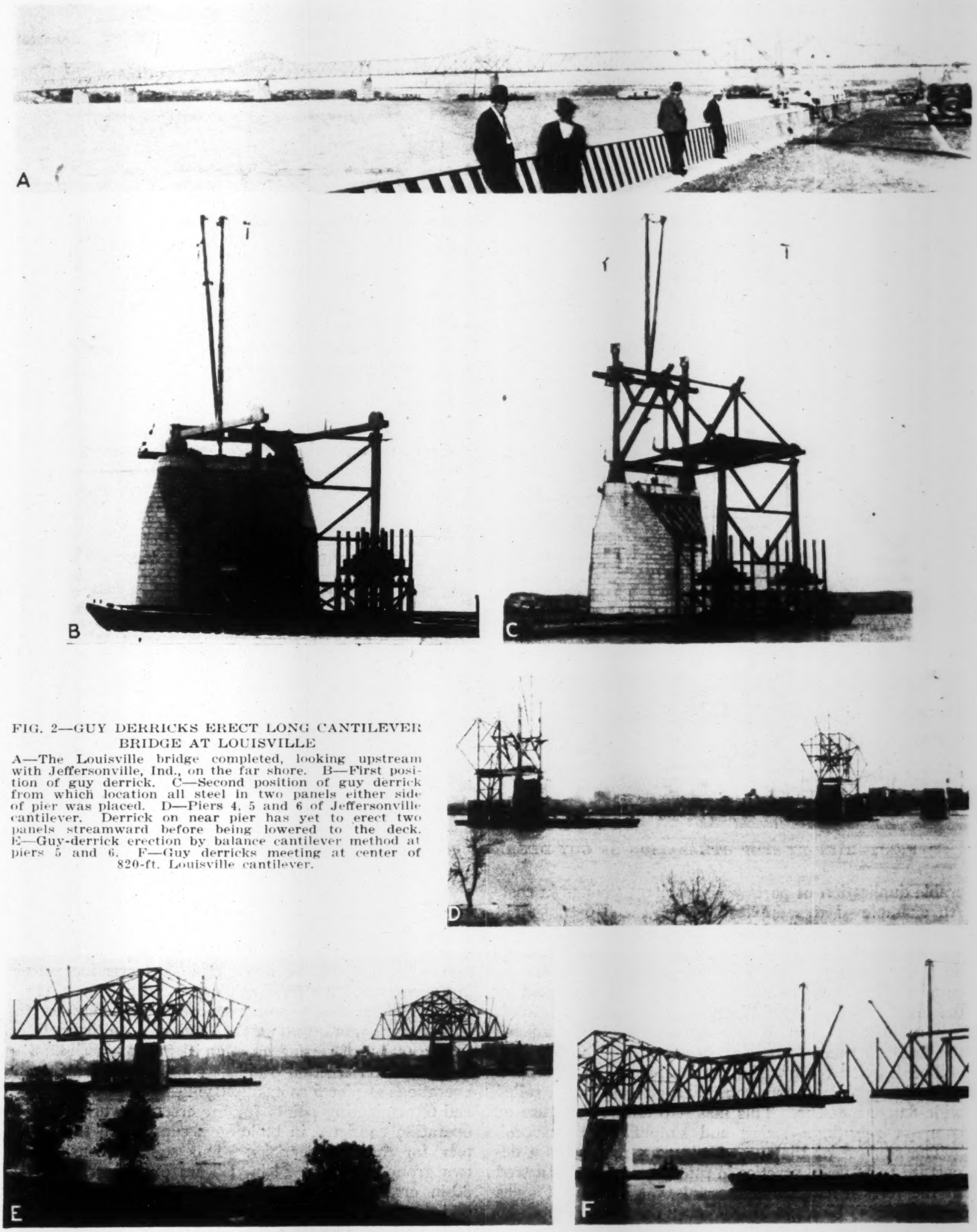


FIG. 2—GUY DERRICKS ERECT LONG CANTILEVER BRIDGE AT LOUISVILLE

A—The Louisville bridge completed, looking upstream with Jeffersonville, Ind., on the far shore. B—First position of guy derrick. C—Second position of guy derrick from which location all steel in two panels either side of pier was placed. D—Piers 4, 5 and 6 of Jeffersonville cantilever. Derrick on near pier has yet to erect two panels streamward before being lowered to the deck. E—Guy-derrick erection by balance cantilever method at piers 5 and 6. F—Guy derricks meeting at center of 820-ft. Louisville cantilever.

a municipal undertaking and financed by income bonds. The bridge replaces an old ferry. As shown in the accompanying illustrations the crossing is effected by means of two cantilever bridges practically identical in design. Each has a cantilever span of 820 ft., one anchor arm of 500 ft. and another of 362 ft.

Design—Several features of the design are worthy of note. The arrangement of spans was controlled by the War Department, which fixed the location of the two 820-ft. channel spans. The arrangement for the balance of the river crossing was determined by economic considerations. The adopted layout permitted consid-

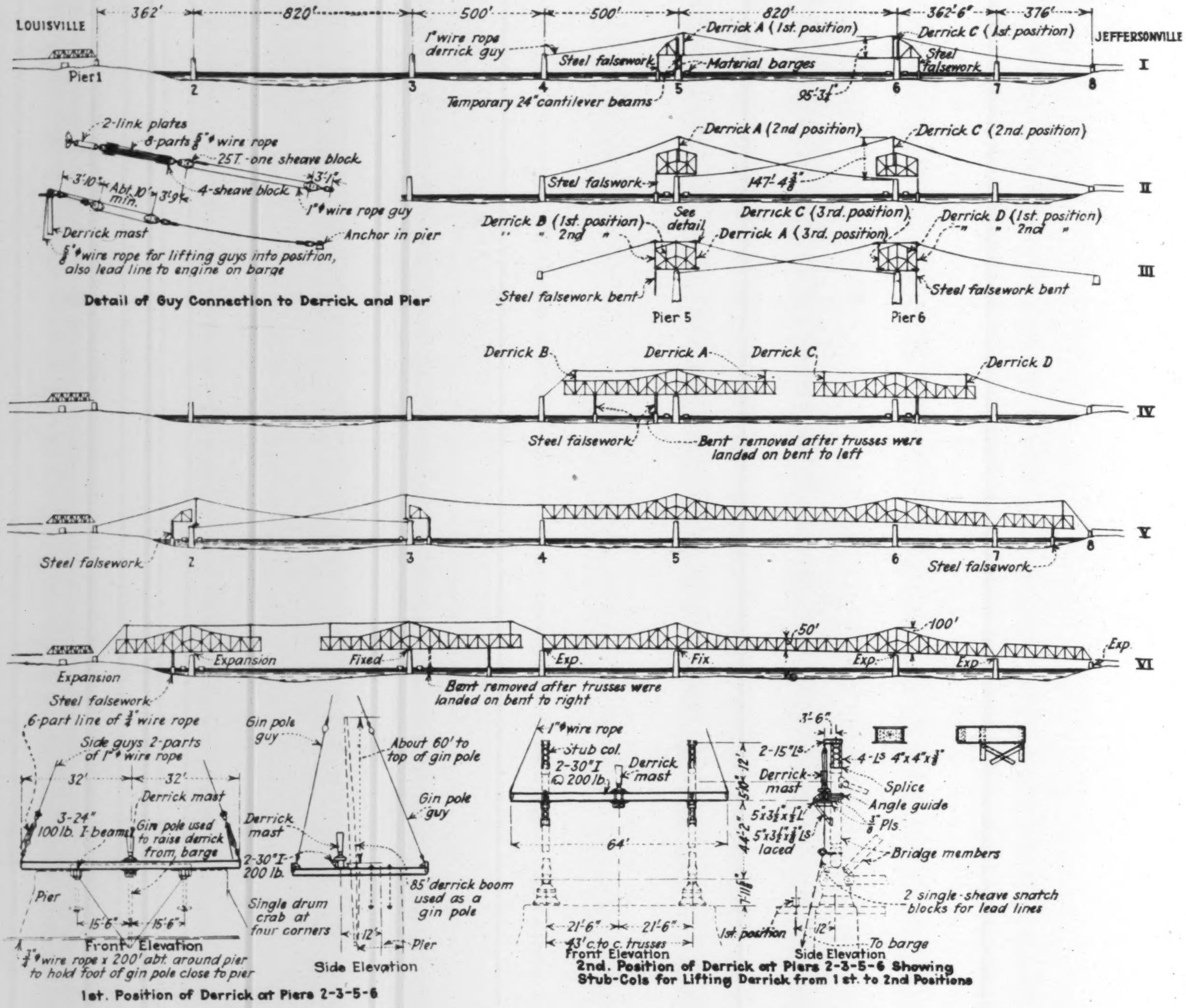

LOUISVILLE
JEFFERSONVILLE
362'
820'
500'
500'
820'
362'-6"
376'
Pier 1
2
3
4
5
6
7
8
1" wire rope derrick guy
Steel falsework
Derrick A (1st. position)
Material barges
Derrick C (1st. position)
Steel falsework
Temporary 24" cantilever beams
95'-3¼"
I
2-link plates
8-parts ⅝" ϕ wire rope
25T. one sheave block
3'-10"
Abt. 10' min.
3'-9"
4-sheave block
3'-1"
1" ϕ wire rope guy
Derrick mast
Anchor in pier
⅝" ϕ wire rope for lifting guys into position, also lead line to engine on barge
Detail of Guy Connection to Derrick and Pier
Derrick A (2nd position)
Derrick C (2nd. position)
Steel falswork
147'-4⅜"
II
Derrick B (1st. position)
" " 2nd "
See detail
Derrick C (3rd. position)
Derrick A (3rd. position)
Derrick D (1st. position)
" " 2nd "
Steel falsework bent
Steel falsework bent
Pier 5
Pier 6
III
Derrick B
Derrick A
Derrick C
Derrick D
Steel falsework
Bent removed after trusses were landed on bent to left
IV
Steel falsework
Steel falsework
V
50'
100'
Expansion
Expansion
Fixed
Exp.
Fix.
Exp.
Exp.
Exp.
Steel falsework
Bent removed after trusses were landed on bent to right
VI
6-part line of ¾" wire rope
Side guys 2-parts of 1" ϕ wire rope
32'
32'
Derrick mast
3-24" 100 lb. I-beams
Gin pole used to raise derrick from barge
Pier
15'-6"
15'-6"
Front Elevation
¾" ϕ wire rope x 200' abt. around pier to hold foot of gin pole close to pier
Gin pole guy
About 60' to top of gin pole
Gin pole guy
Derrick mast
2-30" I 200 lb.
85' derrick boom used as a gin pole
Single drum crab at four corners
12'
Pier
Side Elevation
1st. Position of Derrick at Piers 2-3-5-6
1" ϕ wire rope
Stub col.
2-30" I @ 200 lb.
Derrick mast
64'
12'
5'-0"
44'-2"
7'-11⅛"
21'-6"
21'-6"
43' c. to c. trusses
Front Elevation
3'-6"
2-15" Ls.
Derrick mast
4-Ls 4"x4"x⅜"
Splice
Angle guide
⅜" Pls.
5"x3½"x½" L
5"x3½"x⅜" Ls laced
Bridge members
2 single-sheave snatch blocks for lead lines
1st. position
12'
To barge
Side Elevation
2nd. Position of Derrick at Piers 2-3-5-6 Showing Stub-Cols for Lifting Derrick from 1st. to 2nd Positions

FIG. 3—STEP-BY-STEP UTILIZATION OF GUY DERRICKS FOR ERECTING LOUISVILLE CANTILEVER BRIDGE

erable duplication of parts with resultant savings in cost. An example of this duplication was the 376-ft. simple span at the Jeffersonville end of the structure, which is a duplicate of the two suspended spans. In order to reduce the number of necessary members to a minimum, comparatively long panels were utilized, and, except at the main towers, simple Warren-type trussing was used. For a similar reason, K-type trussing was adopted for the lateral system.

The heavier compression members are of H-section with a center diaphragm consisting generally of a rolled wide-flange member. This make-up allowed the use of comparatively light lacing and simplified fabrication.

The support of the suspended spans represents a departure from usual practice in cantilever design. Instead of the vertical hangars at the ends, the suspended spans are supported by a pin in the lower chord, the top chord members either side of this pinned joint carrying no stress after the suspended span is swung. This design avoids the floor-expansion joint at this point, although it necessitates expansion devices on one of the main piers. It also eliminates any break in the Warren web system of the trusses, which is desirable from the standpoint of appearance. On the other hand, it introduces a stress complication, since the lateral system becomes continuous for each cantilever.

Erection—Figs. 2 and 3 indicate the various arrangements of the guy derricks at different stages of the erection work. It will be noted that steel erection started in the center of the river at piers 5 and 6.

The Jeffersonville cantilever was completely erected before work was begun on the Louisville cantilever, with the exception of raising guy derricks on piers 2 and 3 so that that steel erection could be continuous. Taking the operations at pier 5 as exemplifying those at piers 2, 4, 5 and 6, originating points for the erection work, the first operation consisted in building a support on top of the pier for the guy derricks. This support consisted of two groups of three 24-in. I-beam out-riggers and two 30-in. crossbeams placed parallel to the face of the pier and 12 ft. off the pier center line. The derrick was brought to the base of the pier in a barge. By means of hoisting engines in the barge and sets of wire-rope falls to beams on top of the pier, the derrick boom was lifted upward and lashed to the pier, as shown in Fig. 3, serving as a gin pole to raise the derrick mast into position on top of the 30-in. crossbeams; falls from the top of the mast were then used to lift the boom into position.

Side guys were placed as shown, while the top of the mast was steadied by the main longitudinal guys running to eyebar anchors at piers 4 and 6. These longitudinal guys comprise an important part of the erection layout, particularly when the derrick is operating on the deck as a traveler. The length of these guys was adjusted, as necessary, by means of a double set of blocks inserted in the line at a convenient point. In its first position on the pier the derrick erected the lower members in the first two panels on one side out to a steel falsework bent which had previously been set at the second panel point. With the lower half of the main tower of the bridge erected, the derrick, including the base of 30-in. beams, was raised up the tower to temporary brackets from which position it erected all of the steel in the first two panels either side of the pier. The derrick was jumped up the main tower by attaching temporary stub columns to the top of the lower half of the bridge-tower columns. Block and falls were attached to a short cantilever beam on top of each stub column, and by means of these the derrick was raised approximately 50 ft., and landed on the brackets as shown in Fig. 3.

With steel erection on two panels either side of the main pier completed, the first derrick raised another derrick to the floor of the bridge on the opposite side of the pier. The first derrick was then lowered to the floor of the bridge and the two derricks, mounted on small four-wheeled trucks, worked both ways from the pier, taking the material from barges in the river and erecting it by a balance cantilever method. This same operation was carried on from the other main pier in this cantilever, pier 6, until the steelwork met at the center, when it was joined and swung off in the usual manner. The derricks were then lowered into barges and the same operation performed on the Louisville cantilever.

Operation as Travelers—Mounted upon the four-wheel trucks, the guy derricks were similar to light travelers, but with the power plant missing. The guying arrangement for these travelers is shown in Fig. 4. The traveler was always stopped with the derrick directly over a floorbeam. Underneath this floorbeam a special anchor beam for the side guys was swung, extending several feet beyond the chords of the truss and permitting a somewhat more stable guy arrangement than if the guys had been attached to the inside of the trusses. However, additional side guys were attached at the ends of the floorbeams for extra rigidity. Generally the derrick was moved forward two panels at a time. Briefly, the moving operation was accomplished as follows: The boom was swung to one side and hitched to the deck, after which the guys on this side were detached and moved to the second floorbeam forward, where they were again tightened. The boom was then swung to the other side, and by the same process the guys on this side was moved forward. The anchor beam was then moved ahead and fastened in its new position just behind the floorbeam. The special hold-back line was then drawn taut after which the small stub lines connecting the spider on the masthead to the main longitudinal guy lines were detached. The derrick was pulled forward by lines attached to convenient floorbeams, care being exercised to keep the hold-back line tight during movement.

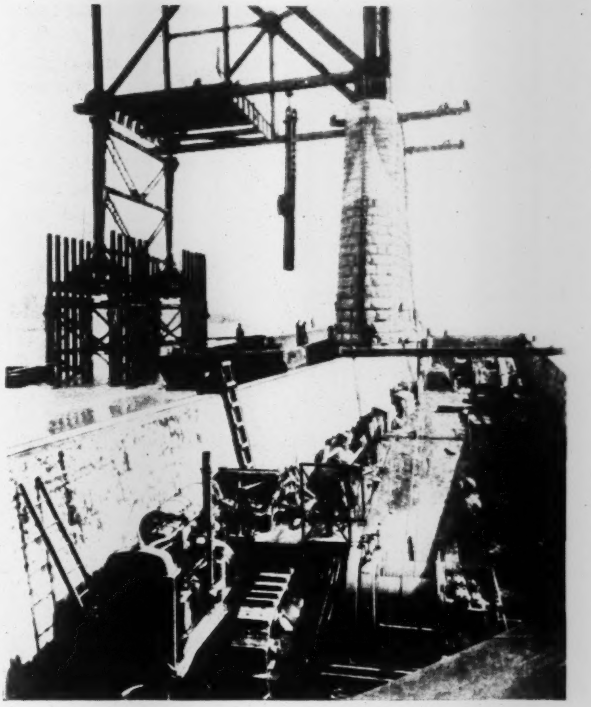
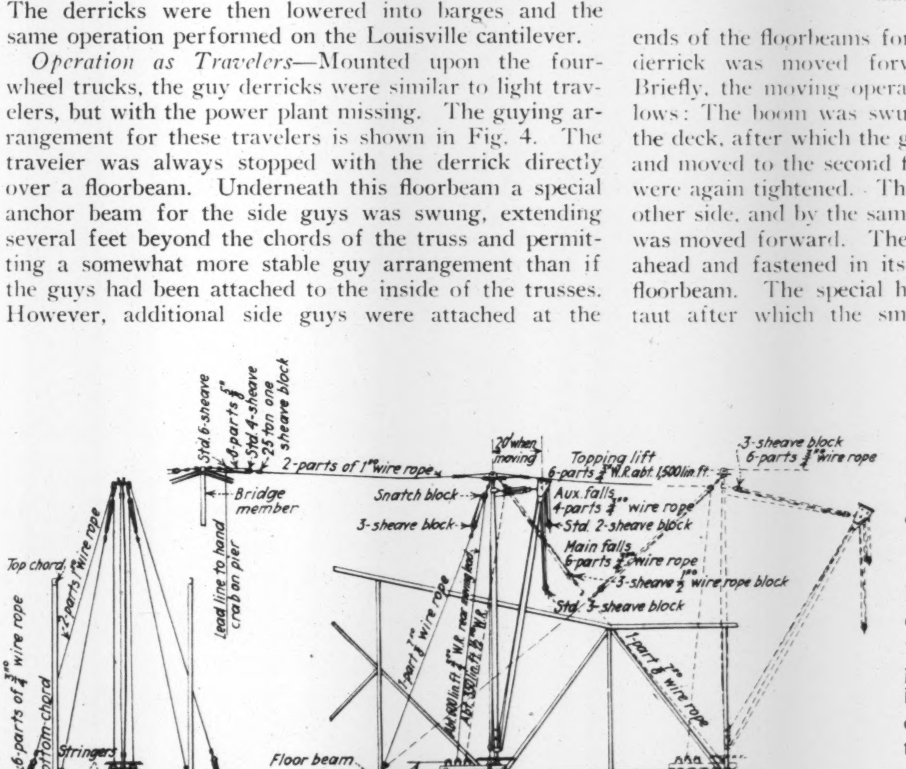


FIG. 5—BARGE POWER PLANT FOR GUY-DERRICK ERECTION OF LOUISVILLE BRIDGE

A standard 60-hp. crawler tractor was utilized. Two drums are attached to the rear of the tractor and a four-drum hoist is mounted at one side, all lines being controlled from the central platform. At the stage of erection shown the derrick is resting on temporary brackets halfway up the main tower.



Std. 6-sheave
8-parts 5/8"
Std. 4-sheave
25 ton one sheave block
2-parts of 1" wire rope
Bridge member
Lead line to hand crab on pier
Top chord
2-parts 1" wire rope
6-parts of 3/4" wire rope
Bottom chord
Stringers
2 rod hangers
Guy anchor beam
To crab
Cross Section
20' when moving
Topping lift
6-parts 3/4" W.R. abt. 1,500 lin. ft.
3-sheave block
6-parts 3/4" wire rope
Snatch block
3-sheave block
Aux. falls
4-parts 3/4" wire rope
Std. 2-sheave block
Main falls
6-parts 3/4" wire rope
3-sheave 1/2" wire rope block
Std. 3-sheave block
1-part 7/8" wire rope
Abt. 600 lin. ft. 3/4" W.R. rear moving load
Abt. 350 lin. ft. 3/4" W.R.
1-part 7/8" wire rope
Floor beam
Swing line to engine on pier about 1,000 lin. ft. of 5/8" wire rope
Guy anchor beam
Elevation

FIG. 4—DETAILS OF THE 20-TON GUY-DERRICK TRAVELER AT LOUISVILLE

The Power Plant — One factor contributing to the lightness of the guy-derrick equipment used on the Louisville bridge was that the power plant was not carried by the bridge structure, but was located in a barge anchored at the foot of the main pier, as shown in Fig. 5. It is built around a 60-hp. crawler tractor, which, like the guy-derrick, is a standard piece of erection equipment that can be used for various other operations around a job. The tractor carries two hoist drums which hold 1,500 ft. of $\frac{3}{4}$-in. wire rope. On one side of the tractor on a separate steel bed another hoist unit of four drums is mounted. This latter unit furnishes swing lines, runner lines and quarter falls or main falls as desired. The hoists are chain-driven from the tractor engine, and all are operated by one man on a central control platform. The tractor provides a lead line pull of 26,000 lb. at 110 ft. per min., and 16,000 lb. at 150 ft. per min. It can easily be disconnected from the hoisting unit and made available for other work.

On the newer types of this plant, a small additional 4-drum shelf hoist is mounted on the tractor itself, thus making a complete hoisting engine, which can move anywhere on its tractor treads. The shelf hoist replaces the customary niggerheads. Twelve wire-rope lines, including main hoist lines and runner lines can be operated by one man from this combination tractor-hoisting unit. Patent applications have been made covering both the guy-derrick method of erecting bridges and the tractor-hoisting apparatus.

P. & W. Va. Railway Viaducts

On a new line that the P. & W. Va. Railway Co. is building out of Pittsburgh, adaptation of guy-derrick erection to deck structures has been successfully accomplished on both truss and plate-girder bridges with no radical departures from the methods used on the Louisville cantilever. However, differences in the nature of the sites and the fact that the viaducts are extremely high and narrow required certain alterations in details of the work that are interesting.

A Deck-Truss Bridge—The Monongahela River crossing of the new railroad line at Belle Vernon, Pa., is effected by a single-track deck truss, flanked by several spans of deck girders as shown in Fig. 6. Erection had to be started from the valley bottom since the bridge was to be completed before the grade at either end would permit access to the structure. The Pennsylvania Railroad ran along the south side of the river near pier 5 and the Pittsburgh & Lake Erie Railroad along the north side of the river near pier 12. Consequently, material yards were established on each side of the river at these points and the steel shipped in by rail. See Fig. 6 for numbers of piers.

Steel erection on the south side began at tower 5-6 (Fig. 6), which was raised with a guy derrick much as the framework of a steel building is erected. Another guy derrick was placed on top of the tower after the erecting derrick was up, in order to feed the erecting derrick which moved south and another derrick later assembled to erect the trusses from the tower to the center of the river span.

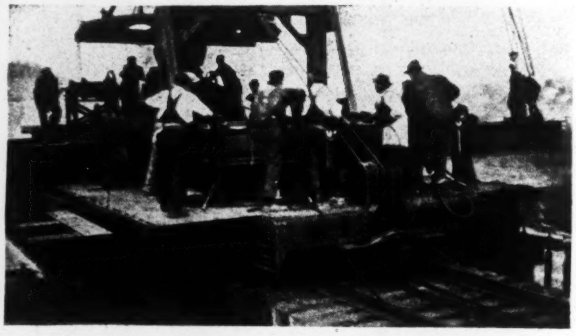


FIG 7—GUY-DERRICK ERECTION CAR ON DECK-TRUSS VIADUCT AT BELLE VERNON, PA.
Note built-up erection stool on top chord in left foreground used as sliding bed when moving car.

On the north side operations began at pier 11, the derrick first being slid up the pier to a position on outriggers at the top. From this position it erected the falsework bent between piers 11 and 12, followed by the steel-work from pier 11 to this falsework bent, as shown in Fig. 7. This derrick then raised a second or yard derrick to the top chord of the span and the yard derrick in turn lifted the first derrick to the same elevation from its position on the outriggers. The erecting derrick then worked to the north abutment while the yard derrick placed a falsework bent between spans 10 and 11, erected the steel from pier 11 to this bent and raised a third derrick which proceeded to erect the steel to the middle of the river span.

The heaviest single pieces to be lifted weighed 45 tons. All material was raised by the yard derrick from the material yard about 150 ft. below. It was then transferred to railway push cars, rolled out to the erecting derrick, which after picking it up, boomed up tight against the mast, turned under the guys and placed the steel in the structure out in front.

Plate-Girder Viaducts—Although there was enough plate-girder viaduct in the Belle Vernon bridge to try out the guy-derrick erection scheme, it received its most rigid test on four long and very high plate-girder viaducts at other points on the line. One of these, located

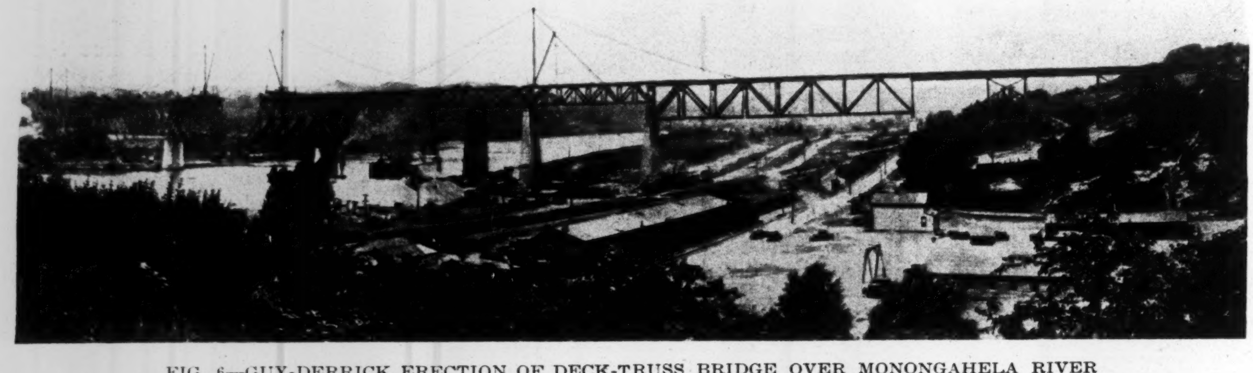


FIG. 6—GUY-DERRICK ERECTION OF DECK-TRUSS BRIDGE OVER MONONGAHELA RIVER
Second derrick from south (left) end of bridge is the yard derrick on top of tower 5-6 handling material from the railroad yard below to the deck of the bridge, where it is moved out to erecting derricks, one moving either way. At north end, the derrick to the right, on pier 11, is the yard derrick. The erecting derrick which moved toward shore has been removed. The river piers are numbered from the left, 7, 8, 9 and 10.

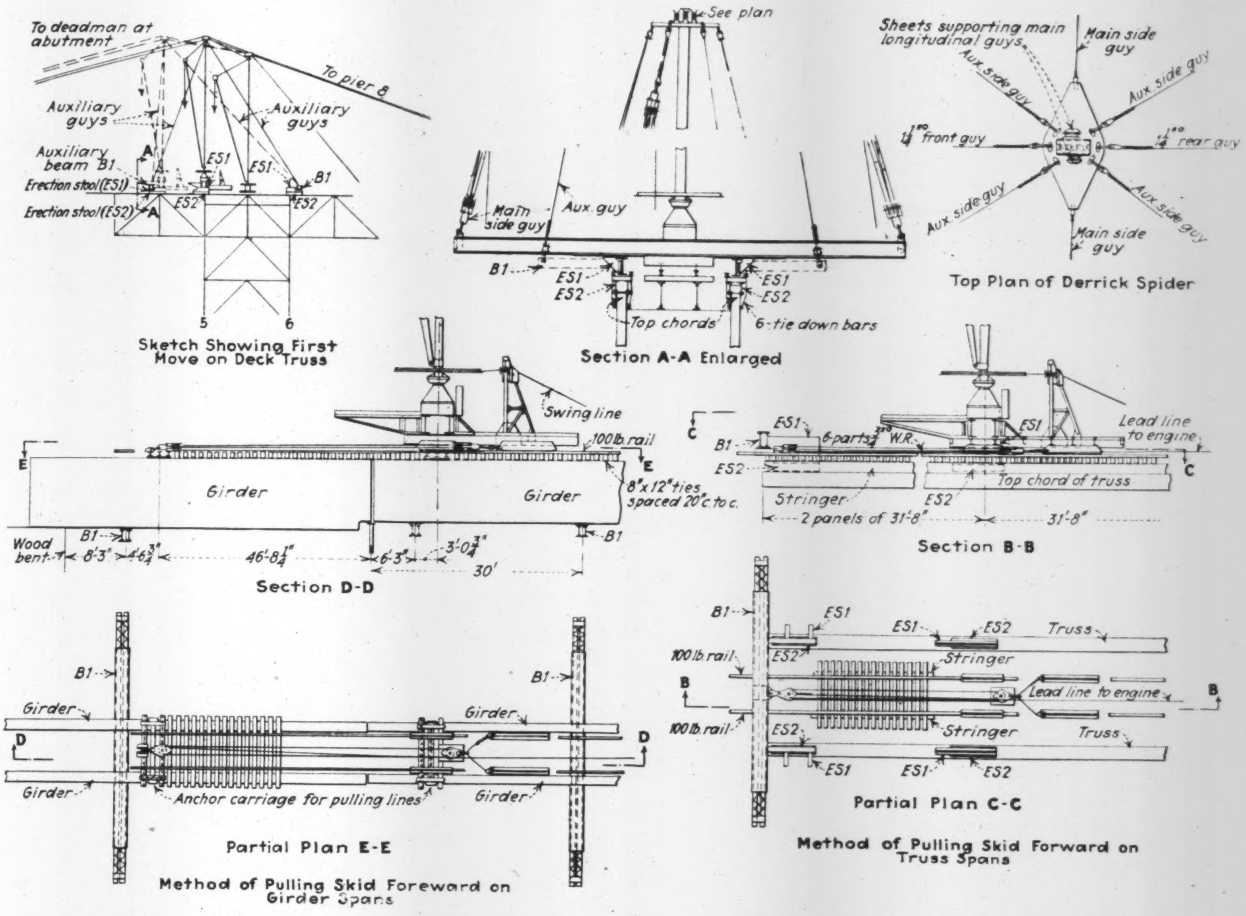

To deadman at abutment
To pier 8
Auxiliary guys
Auxiliary guys
Auxiliary beam B1
Erection stool (ES1)
Erection stool (ES2)
A
A
ES1
ES1
B1
ES2
ES2
5
6
Sketch Showing First Move on Deck Truss
See plan
Main side guy
Aux. guy
B1
ES1
ES2
ES1
ES2
Top chords
6-tie down bars
Section A-A Enlarged
Sheets supporting main longitudinal guys
Main side guy
Aux. side guy
Aux. side guy
1¼" front guy
1¼" rear guy
Aux. side guy
Aux. side guy
Main side guy
Top Plan of Derrick Spider
Swing line
100 lb. rail
E
E
Girder
Girder
8"x12" ties spaced 20" c. to c.
Wood bent
B1
B1
8'-3"
4'-6¾"
46'-8¼"
6'-3"
3'-0¾"
30'
Section D-D
C
C
ES1
B1
6 parts ¾" W.R.
ES1
Lead line to engine
ES2
Top chord of truss
Stringer
ES2
2 panels of 31'-8"
31'-8"
Section B-B
B1
Girder
D
D
Girder
Girder
Girder
Anchor carriage for pulling lines
B1
Partial Plan E-E
Method of Pulling Skid Foreward on Girder Spans
B1
ES1
ES1
ES2
Truss
100 lb. rail
ES2
Stringer
B
B
Lead line to engine
100 lb. rail
ES2
Stringer
Truss
ES1
ES1
ES2
Partial Plan C-C
Method of Pulling Skid Forward on Truss Spans

FIG. 8—DETAILS OF METHOD OF MOVING GUY DERRICKS IN ERECTING DECK-TRUSS AND GIRDER VIADUCTS
Absence of floorbeams requires use of auxiliary crossbeams for attachment of moving cables.

at Charleroi, Pa., and typical of the others, is shown in Fig. 1. It is approximately 900 ft. long and contains about 900 tons of steel. The largest pieces are 130 ft. long and weigh 60 tons. As in the Monongahela River crossing, the girders are 6½ ft. on centers. All steel is delivered over the highway and erected from the ground, the first derrick raising one of the towers (following procedure similar to that used to erect steel-tier buildings) and then working both ways from this point.

Moving the Derricks—Unlike the derricks on the Louisville bridge, which were mounted on small railroad trucks, the derricks for these deck structures were mounted on skids or erection stools. On the truss spans, the side guy-beams were blocked and anchored to the top chords of the truss at the panel points where the erecting was being done. A similar arrangement was used on the deck-girder spans except when the derricks were blocked up over a tower, when a set of falls was placed on each side of the guy beam and fastened to the base of the viaduct tower, which provided additional stability.

In Fig. 8 are shown details of the methods of moving the derricks forward. On the plate-girder viaducts, which were only 6½ ft. wide, long crossbeams had to be placed under the girders 30 or 40 ft. ahead and behind the derricks to provide attachments for the auxiliary moving falls. On the deck trusses these crossbeams rested on the top chords. These long crossbeams, in effect, correspond to the regular floorbeams of a through bridge.

With several derricks on the structure it was necessary to provide some means for keeping the various longitudinal guys from fouling one another. This was accomplished by placing sheaves on top of the spiders of the guy derricks so that the longitudinal guys could be carried over these and anchored at the ends of the structure. When one of the derricks was moved, the guys from the other derrick passed over the top of the moving derrick on these sheaves, providing a very satisfactory arrangement. The top plan of the derrick spider is shown in Fig. 8.

Administration—The Louisville bridge was designed by Modjeski & Masters, consulting engineers, and the erection was supervised by them under the direction of C. Glennon Melville as resident engineer. The P. & W. Va. Railway Co. bridges were designed in the office of H. H. Temple, chief engineer, by A. N. Doud, bridge engineer. F. L. Riddle is construction engineer for the railway company. The erection work was under the direct charge of James L. de Vou, central division erecting manager of the American Bridge Co., who originated and developed the guy-derrick scheme and also the tractor-hoisting apparatus. General charge of the work was under Richard Khuen, Jr., general manager of erection, and L. A. Paddock, vice-president in charge of operations, American Bridge Co.

Concrete Airship Hangar of Bold Design at Sevilla, Spain

Structure 400x950 Ft. in Plan and 150 Ft. High Made Up of Series of Arch Ribs Joined by 4-In. Concrete Diaphragms

By A. A. Peters
Fox Brothers International Corp., Madrid, Spain

ONE of the most important of current airport construction projects is that at Sevilla, Spain, being built particularly for the use of Zeppelin-type airships and involving a huge arched-roof hangar of reinforced concrete in an unsual and bold design. A duplicate layout is to be constructed at Buenos Aires, and it is expected that regular South American airship service will be inaugurated within the next twelve to eighteen months between the two points. The owner is the Compañia Transaérea Española, which company has concessions from both the Spanish and Argentine governments, together with a considerable yearly cash subsidy from the Spanish government, and an additional mail contract subsidy from Argentina. (It is interesting to note also that the last report of the Goodyear-Zeppelin Corp. on its projected transatlantic service between the United States and Europe stated that Sevilla had been definitely chosen as the European terminus for the ocean crossing of their ships.)

The general layouts for the airports at Sevilla and Buenos Aires include low-type mooring masts, gas factories, generator plants, meteorological and radio stations, airplane hangars, government buildings, passenger stations, two hangars for the lighter-than-air ships and the various incidental structures necessary to a complete station. The final cost for each airport is estimated at approximately $2,000,000. This includes the cost of the land.

An interesting problem grew out of the original plans for the larger of the two airship sheds at Sevilla. This hangar was designed to hold two large dirigibles and called for a building 400 ft. wide, 950 ft. long and 200 ft. high with no internal obstructions. The plans for this large hangar were based on those that were developed for a small war-time steel structure planned for Italy, and it was proposed to utilize a portion of the old steel shipped to that country just prior to the signing of the armistice.

An examination of this steel and the hangar plan itself convinced us of the futility of trying to adapt it to the present purpose. We then proposed to the owners that we would review the hangar plans and see what could be developed. This met with their approval, and we made a rather brief analysis, comparing the costs of a modern structural steel building with an arch design in reinforced concrete. Our tentative concrete design was based somewhat on the outline of the corrugated Nissen huts used in the war. Somewhat to our surprise, the results of the analysis pointed to a reinforced-concrete structure. This led to the employment of Alfonso Peña, of Madrid, one of the foremost engineers in structural design in Spain, who thereupon entered upon the complete working plans for the structure that had been tentatively laid out. The hangar design as shown in the accompanying drawing consists of a series of arch ribs of parabolic outline so arranged that a longitudinal section is corrugated. The sides of the corrugations are very thin, approximating 4 in.

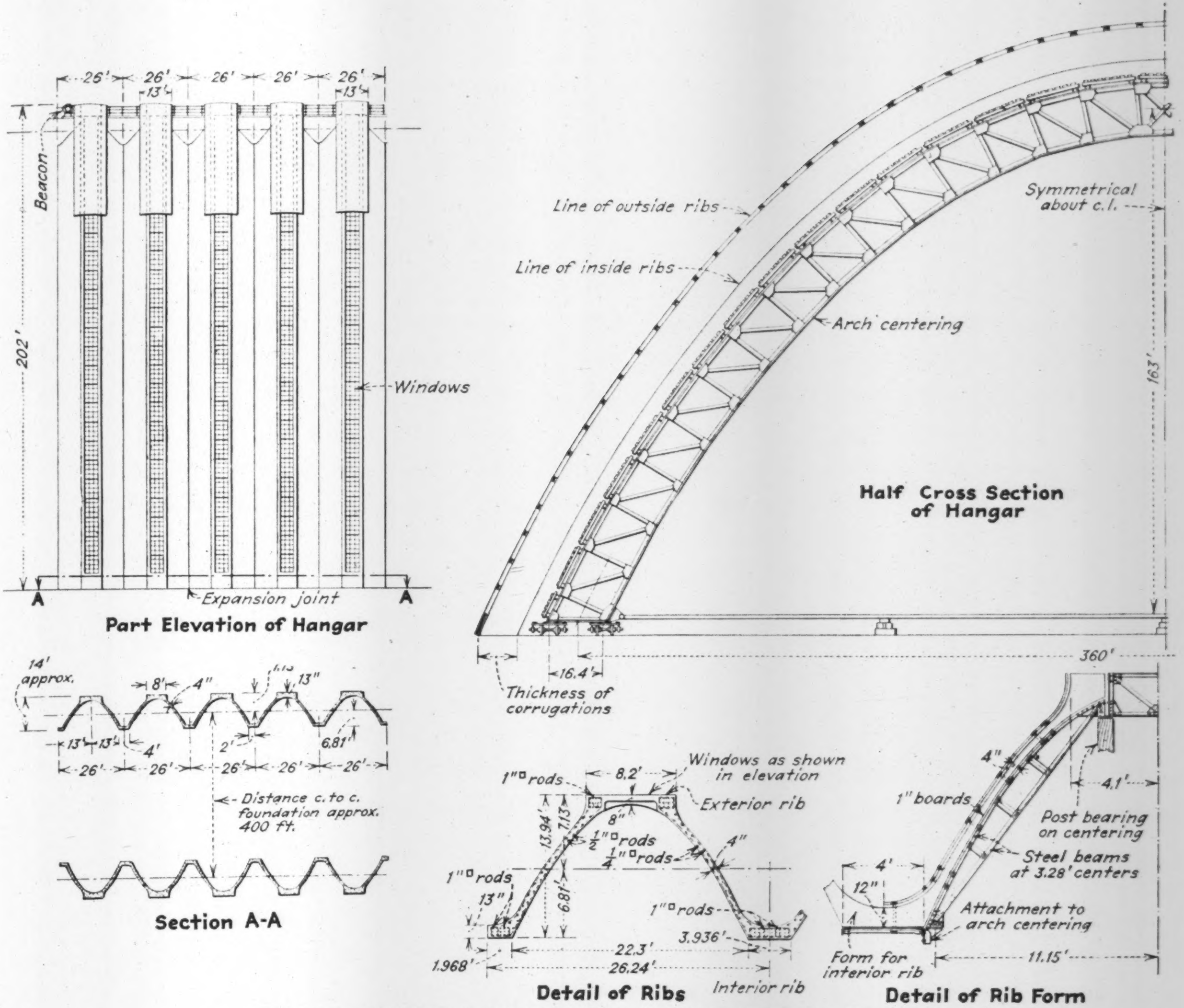
The estimated cost of the building in concrete was considerably under our estimate for an all-steel structure, disregarding capitalization of maintenance charges in both cases. Whether this would apply to all locations is difficult to state without more comprehensive data on labor conditions and costs of materials at the various sites.

Immediate government approval of the substitution was secured and the work of constructing the airport commenced late in 1928. The incidental work such as grading, and the construction of roads and of a concrete bridge, warehouse and living quarters, has been accomplished. An airplane hangar has been constructed, the government building is under way, most of the foundation work for the big shed has been completed and the erection of the steel arch centering was completed about the middle of February, 1930. From this point on, the owner is carrying on the work on a day-labor basis. The accompanying drawings show something of the design of the building. The elevation of one of the three arch centers on which the forms for the bays or corrugations are mounted indicates the magnitude of the building. The three structural steel arches weigh approximatly 630 tons and permit pouring two bays of a total length of about 52 ft. before moving forward. To facilitate the successive forward movement, the form assembly is mounted on four heavy trucks and the moving itself is accomplished by utilizing the hoisting engines of the concreting plant. By synchronizing the movement of guy cables with the pull cables on trucks, a steady movement is obtained.

Each pour contains approximately 900 cu.yd. of concrete, and the concreting plant is designed to pour this in four days. Quick-setting cement imported from England is being used to cut down the time limit on removal of supporting forms, so that the complete cycle of operations for each setup is from twelve to fourteen days. It will be noted from the detail of one of the corrugations that the wall of the bays between ribs has a thickness of approximately 4 in. and contains double lines of reinforcing bars. To secure properly tamped concrete in this limited space and to maintain the position of the reinforcing steel under ordinary methods of pouring and with only average workmen would present a difficult problem of supervision. After some investigation it was planned to lay up this thin wall section by using a cement gun that would pass ½-in. stone. With this gun, there seems to be assurance of a proper placing of the reinforcing steel and of a resultant concrete, homogeneous and strong. Strength is, of course, the vital element in this type of structure, but it is also expected that considerable saving in cost will follow as a result of the elimination of a large amount of labor and material on outside formwork.

The rib sections are poured from swinging pipes carried by the towers and derricks which were constructed to erect the steel centering. The same towers also swing the scaffolding for the cement gun operators.

In discussing the design of the hangar, Mr. Peña emphasizes the fact that since compression is the stress most easily withstood in a concrete structure, a design involving the least flexure and approximating absolute compression is the one which gives the smallest resisting sections and therefore the greatest economy. Such a design is the anti-funicular of the loading. But in a hangar which is subjected to variable loads of tempera-


Part Elevation of Hangar

Section A-A

Half Cross Section of Hangar

Detail of Ribs

Detail of Rib Form

26'
13'
202'
Beacon
Windows
A
Expansion joint
A
14' approx.
8'
4"
13"
13'
4'
2'
6.81"
26'
Distance c. to c. foundation approx. 400 ft.
Line of outside ribs
Line of inside ribs
Arch centering
Symmetrical about c.l.
163'
Thickness of corrugations
16.4'
360'
1" rods
8.2'
Windows as shown in elevation
Exterior rib
13.94'
7.13'
8"
1/2" rods
1/4" rods
4"
6.81'
13"
1" rods
3.936'
22.3'
26.24'
1.968'
Interior rib
4"
4.1'
1" boards
Post bearing on centering
Steel beams at 3.28' centers
4'
12"
Attachment to arch centering
Form for interior rib
11.15'

DETAILS OF REINFORCED-CONCRETE HANGAR AT SEVILLA, SPAIN

ture and wind, it is impossible to design an arch which may be always the anti-funicular of the loading. "However," states Mr. Peña, "if we consider that the dead load is the most important, we can select the form of the arch in such a way that its directrix is an inverted catenary (which is the figure of equilibrium of its own weight) and thus resolve the loading into normal compression. The inevitable flexures resulting from temperature and wind forces will then have a minimum effect, and consequently the most favorable arrangement of the structure is achieved.

"It may be thought that in order to make better use of the material, the catenary should be uniformly of the same maximum strength—that is to say, that the transversal section of the arch should be variable, increasing from the key to the foundations. However, after various studies and experiments with catenary forms of varying sections, that which gives the minimum of total flexures was found to be the normal catenary with constant section. This is the form we have adopted for our use.

"It is not sufficient that the directrix can be defined with this precision, it being further necessary that the flexural moments related to it for a determined inertia serve to arrive at a transversal section which may be the lightest and most economical. It is known in mechanics that for the condition of economy, making compatible a small section with a large amount of inertia, we must spread out the area so as to have small masses, but sufficiently separated from the center of gravity. The corrugated form of section, constructed of parabolic arches of very slight thickness and with strong reinforcement where their legs join, gives us the most favorable arrangement for resisting the flexural moments with the minimum of mass.

"This system may be applied very cheaply and with great economy to arches of greater spans and height than that used here."

The organization of the work and the complete plan of construction plant and methods, together with all of the construction work up to the time that day-labor work was instituted, has been done by Fox Brothers International Corp., of New York. Col. E. N. Johnston, Corps of Engineers, retired, was chief engineer of the company at the inception of the work, and the writer, who is construction engineer for the Iberian Peninsula, had direct charge of the plans and construction of the hangar.

Measuring Rate of Glacial Flow on Mount Hood in Oregon

Surface Flow Almost as Fast in Winter as in Summer—Cross-Section Effect on Flow Rate Contrary to Expectation—More Research Needed

By Earl A. Marshall
Civil Engineer, Portland, Ore.

CONTINUING its studies of ice flow in Eliot Glacier on Mount Hood, the research committee of "The Mazamas," an Oregon organization of mountaineers, has brought out information of an unexpected nature. Studies extending over five summers have shown great differences in the rate of ice movement at different levels; that the movement is nearly as fast in winter as in summer; and that as much as 20 ft. of clear ice, in addition to the winter's snow, may melt, evaporate or otherwise disappear from the surface without a corresponding change in actual surface elevation. A report of earlier findings of this committee was published in *Engineering News-Record,* March 4, 1926, p. 356.

Mount Hood, which is 60 miles east of Portland, reaches an elevation of 11,225 ft., and has on its slope nine glaciers, the largest of which is Eliot Glacier, located on the northeast side. This glacier is 2½ miles long, extending from El. 10,800 to timber line at El. 6,200. Its width averages slightly less than half a mile. The surface grade reduces from 45 deg. near the top to 10 deg. at the foot. Eliot Glacier is an excellent example for study because it is a true ice stream, has one terminus only, and has no obstructions in its channel; further, the rockside walls afford stable points for reference lines.

Until the last of June most of the surface usually is covered by snow, with deep drifts under the cliffs at the sides. At this time crevasses appear mainly as "ice falls" where the glacier passes over cliffs in its bed. About the first of July small crevasses begin to appear at levels above El. 7,000 ft. The snow covering melts rapidly and by the middle of July nearly all the lower glacier is exposed and networks of crevasses appear on large areas of the upper glacier. These crevasses widen rapidly and during the season reach a maximum width of 10 to 15 ft., with an average depth of 30 or 40 ft. At the "ice falls" crevasse widths as great as 30 ft. and depths up to 100 ft. are occasionally found. Since the thickness or depth of ice in the glacier is believed to be several hundred feet, this surface crevassing can have only a minor effect on the flow.

The first snow to remain throughout the winter falls in October. The direct fall is supplemented by drifting from the slopes above, so that the average winter depth on the upper part of the glacier probably exceeds 40 ft.

The committee's work on the glacier began July 12, 1925, when the first transit line was run across the channel. Later, transit lines were established at three levels—namely, El. 7,800, El. 7,200 and El. 6,500, respectively. The ends of these lines were marked with paint on the rock cliffs on each side, and stakes 1⅜ in. in diameter and 8 ft. long were set in the ice at intervals along the lines. From time to time the lines are rerun with a transit and the downstream movement of the stakes is noted. At each successive visit to the glacier the holes in which the stakes are set have to be drilled deeper into the ice to offset the effect of surface melting.

One of the difficulties that confronted the committee in carrying on this investigation was the great physical effort required in drilling these holes into the ice. On

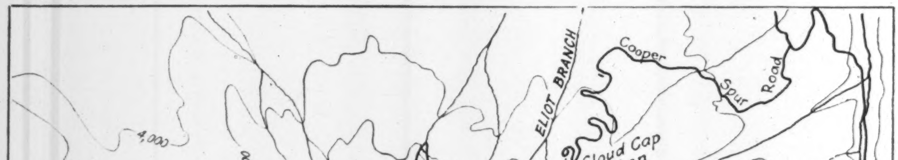


FIG. 1—PLAN OF MOUNT HOOD, SHOWING LOCATION OF ELIOT GLACIER

reading in *Engineering News-Record* of this difficulty as described in the earlier report of the committee, J. E. Sears, a Canadian engineer experienced in ice drilling, suggested a more effective type of drill (described in *Engineering News-Record,* May 13, 1926, p. 783). Since receiving this suggestion, for which the committee is most grateful, the chisels used have been of the shape technically known as a ship carpenter's slick, 1½ in. wide, welded to the end of an 8-ft. length of ½-in. iron pipe. This is used as a churn drill with water to float out the chips. With it two men can drill a hole 8 ft. deep in twelve minutes—more than twice the best progress possible with types of drills previously used. To save drilling along the lower lines where large rocks are found on the glacier, the rocks are used as markers, a cross and identification number being painted on each rock and the distance of the rock from the transit being recorded on each visit.

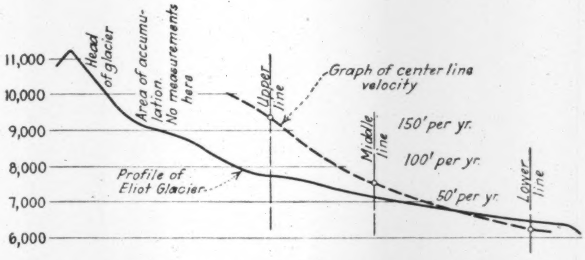


FIG. 2—PROFILE OF ELIOT GLACIER, NATURAL SCALE
Dotted line shows movement graphically.
See table for figures.

To provide markers which would remain in place on the ice surface of the upper line throughout the winter, the committee designed a cross made of two pieces of $\frac{3}{16}$x1¼-in. strap iron 4 ft. long with an additional 6 in. bent down on each end at right angles. These were bolted together on the glacier, using braces to hold the pieces at right angles, and the legs were set in shallow holes, leaving the main bars about 3 in. above the ice.

These devices were designed to be heavy enough so that they would not be blown away by windstorms or buried in the ice as a result of heat absorbed from the sun's rays. It was expected that the heat transmitted to the legs would cause them to melt into the ice as fast as the surface melted. This result was obtained, the bars remaining clear of the surface of the ice at all times.

FIG. 3—MOUNT HOOD FROM LOWER END OF ELIOT GLACIER
Locations of two of the transit lines are indicated.

The design would have been improved by including an arrangement at the center to hold a pole about 3 ft. long to facilitate finding them.

Five Years of Measurement

The results of summer measurements of ice flow in the five years during which the investigation has been under way are given in the accompanying tables. These tables show a great difference in rate of movement on the three lines. In the middle of the upper line the average yearly movement has been 161 ft., at the middle line 74 ft., and at the lower line only 10 ft. The volume of flow of ice would show even grater differences because the glacial channel section is smaller at the lower lines.

For more than half the year it is winter on the mountain, during which time the glacier is covered with deep snow and low temperatures prevail. Despite this the winter movement on the lower lines is about the same as the summer movement, and at the upper line four-fifths the summer movement. During the winter the flow of water from the glacier is less than in summer and no direct evaporation from the ice into the air can take place. The explanation of the rapid winter movement, therefore, awaits more thorough work than the Mazama committee has been able to do.

Melting and Accumulation

That in one summer at least 20 ft. of clear ice would melt from the surface of Eliot Glacier at high elevation was entirely unexpected by experienced mountaineers. This happened each of the two summers the melting was measured and it is believed that during the five summers

TABULATION OF ICE MOVEMENT ACROSS THREE TRANSIT LINES ON ELIOT GLACIER

Dist. from S.E. Cliff, Ft.	Stake No.	Sept. 13 to Oct. 18, 1925. Five Weeks		Oct. 18, 1925 to June 13, 1926. 34 Weeks		June 13 to Sept. 11, 1926. 13 Weeks		One Year, 1925–1926		One Year		
		Total Movement	Average Per Week	Total Movement	Average Per Week	Total Movement	Average Per Week	Total Movement	Average Per Week	1926–1927	1927–1928	1928–1929
Movement at Upper Line—El 7,800, Length 2,400 ft.												
349	2	4.8	1.0	36.0	1.1	23.0	1.8	63.8	1.2	75.3	89.0	....
1,205	5	16.8	3.4	111.2	3.3	50.4	3.9	178.4	3.4	132.6	168.0	167.0
1,505	6	15.9	3.2	96.5	2.8	45.6	3.5	158.0	3.0	145.8	184.0	161.0
1,781	7	15.1	3.0	87.0	2.6	43.7	3.4	145.8	2.8	.....	.....	....
Movement at Middle Line—El. 7,200, Length 1,680 ft.												
1,680	3	1.5	0.3	15.0	0.5	19.5	1.5	36.0	0.7	32.4	.....	....
930	6	8.0	1.6	56.7	1.7	17.3	1.3	82.0	1.6	76.5	132.0	
815	7	9.0	1.8	54.2	1.6	23.2	1.8	86.4	1.7	72.2	73.0	63.0
615	8	8.2	1.6	49.0	1.5	21.8	1.7	79.0	1.5	65.5	66.5	....
405	9	4.9	1.0	31.8	0.9	.....	.....	.....	.....	.....	.....	....
Movement at Lowest Line—El. 6,500, Length 1,125 ft.												
181	2	0.44	0.09	4.66	0.14	0.60	0.05	5.70	0.11	5.95	7.55	5.75
382	4	1.00	0.20	5.80	0.17	2.04	0.16	8.84	0.17	9.51	7.80	6.55
646	6	0.87	0.17	7.23	0.21	3.62	0.28	11.72	0.23	9.68	.....	.....
847	7	0.70	0.14	6.20	0.18	4.36	0.34	11.26	0.22	9.64	.....	.....
972	8	0.58	0.12	6.02	0.18	3.16	0.24	9.76	0.19	.....	18.16	7.10
1,097	9	0.62	0.12	5.28	0.16	3.25	0.25	9.15	0.18	.....	16.0	5.70

of observation at least 100 ft. of ice has melted off the center portion of the glacier in the vicinity of the upper line. In contrast to this, at some points along the sides there has been some accumulation. The melting from the surface was brought to the committee's attention by the need for deepening the stake holes at each successive visit.

Despite this melting no noticeable change takes place in the shape of the transverse section of the glacier on this transit line, although on the average the surface is 10 or 15 ft. lower throughout than at the beginning. The profile of the middle and lower lines changed considerably, there being a general lowering of at least 20 ft. The terminus of the glacier has retreated 30 or 40 ft. in the five-year period, the exact amount being difficult to measure owing to changes in shape.

It is the writer's opinion that glaciers such as this one reach a state of approximate equilibrium where the accumulation from snow on the upper part is equal to the melting on the lower portion. The thickness of ice at all points remains such that the head is just sufficient to produce a movement equal to the melting. The movement forward at the terminus is balanced by the melting on the face. If this melting does not equal the forward movement, the glacier advances. If the melting is greater than the forward movement, it retreats. A substantial retreat would be accompanied by a lowering of the level throughout the glacier.

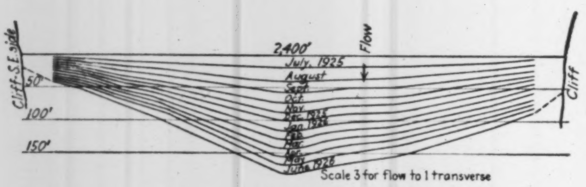


FIG. 4—PLAN SHOWING FLOW AT EL. 7,800 FOR TWELVE-MONTH PERIOD
Monthly movement interpolated between actual observations.

Melting in the middle, as at the upper line established in this investigation, is accompanied by a surface rise eventually about equal to the melting, thereby maintaining the general equilibrium. Because of this and because of the faster movement in the middle portions, there must be a movement from the sides toward the center. On this theory a block of ice as it proceeds down the glacier, melting on the top and on the bottom, would rise on top and go down to the ground on the bottom but would become smaller in the other dimensions. More explicitly, a block of ice 161 ft. long in the middle of the upper line would have to become 74 ft. long at the middle line and 10 ft. long at the lower line.

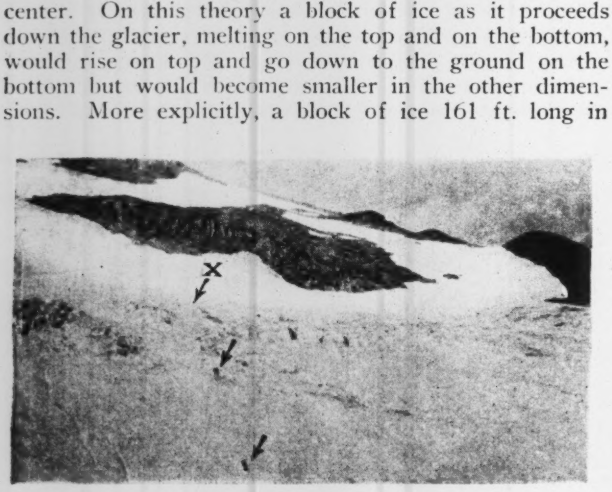


FIG. 5—LOOKING ACROSS THE GLACIER AT LINE NO. 1
Arrows locate rodmen at stations.
Station X is halfway across.

FIG. 6—LATE SUMMER VIEW OF CREVASSED GLACIER SURFACE

Changes in Rate of Flow

During the winter the ratio of movement of the upper and middle lines was nearly 2 to 1. Some of this difference can be accounted for by the closing up of crevasses, some by the adjustment to fill the voids of summer melting and some by a general rising of the ice throughout to overcome increased internal resistance, though this latter is probably taken care of by the weight of snow.

A large part of the difference of speed and consequent difference in volume of flow in the winter season must be accounted for by a melting of ice and a flow of water. This melting must all have occurred within and at the bottom, as the surface was covered with a blanket of snow. Internal melting occurs in the innumerable crevasses and water channels. There is also a release of heat due to friction upon rock and molecular release of heat in accordance with the regulation theory of molecular movement.

It is to be regretted that the resources available to the Mazama committee do not permit investigation of the various flow theories. It would be desirable to make flow measurements at still higher altitudes; movement from the sides toward the center should be measured; melting should be carefully observed and a profile of each line run several times each year. Particularly, effort should be made to make measurements in the middle of winter (which would be difficult on account of points being hidden by snow). An automatic flow recorder should be installed on the stream leaving the glacier, and careful records should be kept on snowfall, temperature, and related data.

In the main, the recent field work of the Mazama research committee has been carried out by Fred W. Stadter, Charles Wilson and the writer, the latter having served three years as chairman of the committee. C. P. Richards is the 1930 chairman of the research committee.

Roads in Hungary

According to information from the Royal Hungarian Ministry of Commerce, which has charge of the construction and maintenance of roads, on May 1, 1930, there were in Hungary 2,311 miles of earth, sand clay or gravel roads, graded and drained; 9 miles of waterbound macadam; 33 miles of waterbound macadam, surface treated; 37 miles of asphalt; 19 miles of cement concrete; 192 miles of stone surface; and 40 miles of unclassified road.

Difficult Work on Highway Fill in Muck-Bottom Lake

Placing and Settling of Material — Muck Forced Up Like an Island—Mattress and Rock Revetment

BUILDING a 1,600-ft. fill on 5 to 25 ft. of soft muck, under water 5 to 10 ft. deep and underlaid by clay and lignite coal, was a necessary operation in replacing the trestle approaches to a 125-ft. swing bridge on a highway crossing Upper des Lacs Lake near Bowbells, N. D. This muck squeezed out under the load and rose above water in ridges along each side of the fill. This fill was completed in May, 1929, and a gravel road was built across it. Since then it has settled about 8 in. along the connection of the fills, which was made on muck so compact that it did not move out laterally to any extent. Slipping of the side slopes has been negligible except at the west end of the swing span. Traffic was detoured around the lake during the construction work. This troublesome job was described by A. S. Marean, resident engineer, in the *North Dakota Highway Bulletin.* Information taken from this article has been supplemented by additional details from Mr. Marean. The contract was let to Schultz Brothers, of Bowbells, N. D., at $98,361, while the actual cost of the completed work was $123,818. In Fig. 1 is shown the appearance during filling, while Fig. 2 shows the completed fill and highway.

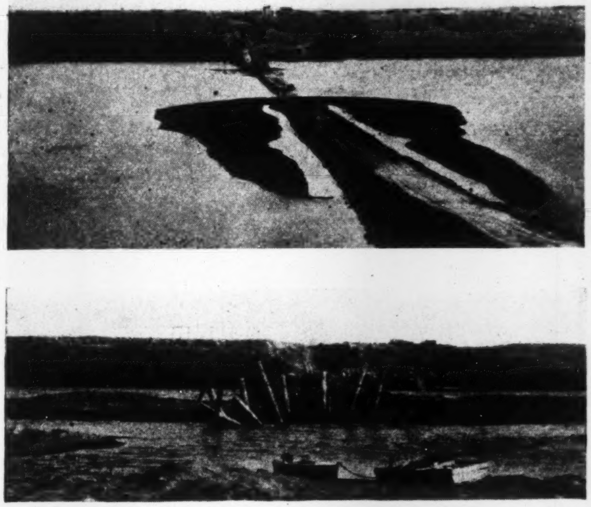


FIG. 1—MAKING FILL ACROSS UPPER DES LACS LAKE
Above: looking east, horseshoe of muck around end of west dump; beyond is muck rising at old bridge. Below: looking west, note islands of muck and displacement of piles of old trestle: new piling at right angles to fill is for channel at bridge.

With a 28-ft. top and slopes of 1 on 2 to the water line and 1 on 3 below water, as originally planned, the estimated quantity for the fill was 142,000 cu.yd., allowing 40 per cent for shrinkage. As the height was increased 1 ft. and the width was increased to 31 ft., the actual quantity placed was about 167,000 cu.yd., while the settled slopes were about 1 on 2 above water and 1 on 2½ below water. The upper slope as dumped was about 1 on 1½ but was bladed down to 1 on 2 by hand work. To protect the channel a row of 50-ft. piles was driven on each side and braced with loose rock dumped on the channel side. A bridge seat and bulkhead 30 ft. long, built of 10x10-in. timbers, was placed behind the piling, being anchored by cables and planks to a trestle bent which in turn was braced to another bent by planks. The old bridge, built about 1905-1906 and remaining in place, is of the low Warren-truss type carried mainly by a cylinder pier of concrete in a steel shell about 16 ft. long, the concrete resting on piles driven in the bottom of the shell.

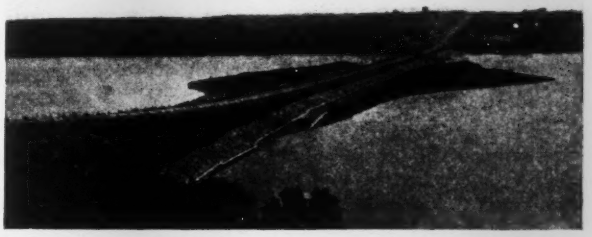


FIG. 2—COMPLETED FILL AND HIGHWAY, JUNE, 1929

Making the Fill—Side-dumping from a narrow-gage track was proposed, but the condition of the trestle led to the end-dump method, using 1½- and 2½-yd. dump wagons hauled by tractors, and leveling the fill with a plow or bulldozer on a 10-ton tractor. Sometimes two tractors were required to haul one wagon over the soft ground after heavy rains. The wagons were loaded by power shovels in cuts high up on the steep banks, with grades of 7 to 15 per cent down to the road. The material was mainly dark yellow clay with some quicksand and soft slippery clay. The deck of the old trestle was removed before or ahead of the dumping and the piles were either broken off and pushed to one side by the fill, while many were buried as no extras were allowed for pulling them. Some piles that obstructed the mat revetment were pulled by the contractor at his own expense.

East End Fill—When the shorter east side dump was 200 to 300 ft. long, patches of muck appeared above water 80 to 100 ft. on each side and then around the head of the fill. The pile bent to which the bridge seat was anchored was secured by four ¾-in. cables fastened to a deadman buried in the fill, but the piles broke below the muck. It was then decided to anchor all the channel piles to deadmen, but when work was resumed and the fill was within 50 ft. of the bridge, the end piles went 9 ft. forward while those supporting the bridge seat and bulkhead moved out 1 ft. towards the swing span in spite of 1,300 cu.yd. of rock on the outer

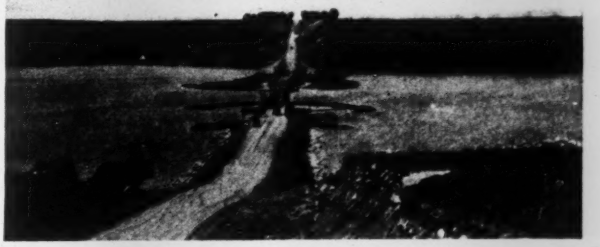


FIG. 3—CLOSURE OF FILL
Muck and old piles forced up between toes of the two dumps.

side, thus preventing operation of the bridge. Although the muck sloped 1 on 4 and was 14 ft. deep under 10 ft. of water, the rockfill had shown no sign of settlement.

A temporary trestle was built from the dump to the span, and material was bulldozed from the bridge, but the handling of tractors, wagons and bulldozer on an 18-ft. through-truss bridge was too slow. Later the bulldozer was operated from a distance by means of two tractors with cables. This also was slow and teams with wheeled scrapers finished this part of the fill while the grading outfit was carried to the other shore by barges.

West End Fill—Here, the difficulties were greater. A quaking mass of ill-smelling dark gumbo was pushed up steadily by the fill, being often 6 ft. above the water and breaking off the old piles below the surface of the muck. It hardened and fissured and would bear a man's weight. As a rule, a narrow channel of water remained along the fill, but sometimes the muck would pile up and roll back on the slope. Directly ahead of the fill the muck was so compact that when covered with only about a foot of new fill it carried a 10-ton tractor, although this was done by a reckless driver and such dangerous practice was then forbidden. In Fig. 3 the two dumps have nearly met. The boats are on the end of the west dump and the old trestle piles have been raised and displaced by the muck forced up between the two dumps.

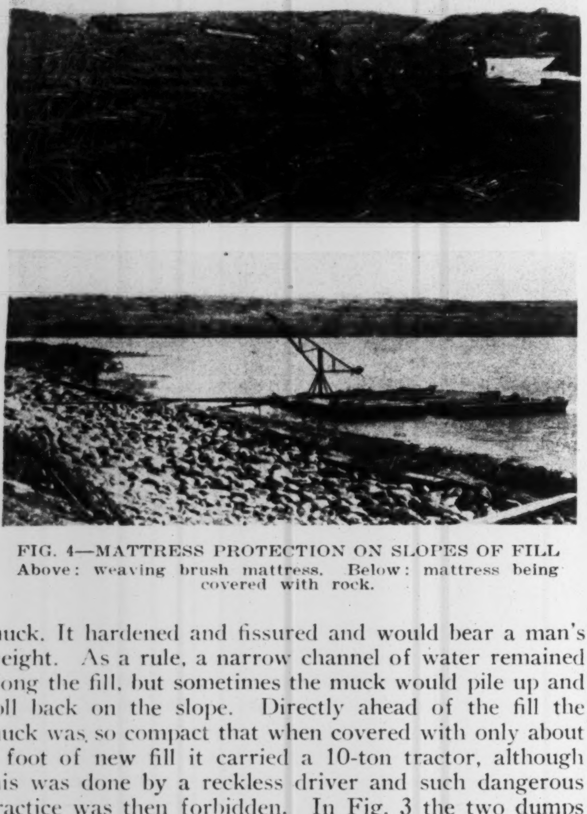


FIG. 4—MATTRESS PROTECTION ON SLOPES OF FILL
Above: weaving brush mattress. Below: mattress being covered with rock.

Settlement and Slides—The entire fill had to be raised 12 to 24 in. every week and some weeks no advance was made, the outfit being kept busy in holding what had been gained. At night stretches of the fill would crack off in lengths up to 100 ft. Settlement ranged from a few inches to 4 ft. A section 25 to 30 sq.ft. along the center line dropped 3 ft. and one night about 50 ft. of fill sank out of sight. This part had been constructed for some time. Each settlement spread the muck farther, the outer edge often being 125 ft. from the toe of slope.

Rockfill—Stone was added throughout the season to the rockfill at the ends of the swing span, the stone being 4 or 5 ft. above the water. At the east end the rock would remain stationary for a short time, then settle slowly or disappear over night. The piles supporting the bridge seat and bulkhead were forced back into place by clearing the gap between dump and bridge and adding all the rock that could be placed in front of the piling, more rock being added as it settled. The piles on the ends of the line have gone back partly but probably never will return to their original position. A total of 9,000 cu.yd. of rock was placed. Muck was forced up and the east channel at the bridge was practically blocked for a time, but finally the muck settled away owing to the current that was formed when the fill narrowed the waterway.

Mat Protection—To protect the side slopes from wave action and ice shoves a brush mattress 30 ft. wide was laid on each side (see Fig. 2), extending 15 ft. above and below the water. It was anchored by longitudinal and transverse cables, the latter passing under and over the mat, thence through trenches cut in the embankment to the mat on the opposite side. Upon this mattress stone paving of field rock was laid, 1 ft. thick at the edges and 2 ft. at the water line. The woven mattress and rock covering are shown in Fig. 4. Cribbing was placed at the lower edge of the mattress to prevent the paving from slipping. As an additional precaution a floating boom of timber in sections 50 ft. long was installed on each side of the fill. About 90,000 sq.ft. of mattress was made with willows and chokecherry brush, the latter weaving into a heavier mat owing to its numerous small branches. Stone for covering the mat was gathered along the shore and hauled over the ice by horse-drawn sleds in loads of 2 to 7 cu.yd. That part of the mat upon the ice settled during the break-up without disturbing the paving to any extent.

What action the drifting ice will have upon it, remains to be seen. It has been stated by old settlers that in some years the ice, 2 ft. thick or more, breaks up before much thaw has taken place and with a strong wind the old trestle would be badly battered by the ice floes. Piles would be carried away and the large cakes of ice would pile up until some would slide over the deck, carrying away the railings.

Twin Turbine Generators Break Size Record

Two steam turbine generators that will set several records for capacity and size are being constructed at the Schenectady, N. Y., works of the General Electric Co. for installation in the Hudson Ave. station of the Brooklyn Edison Co. Each of these units will produce 160,000 kw. at 0.8 power factor, with a maximum output of 200,000 kva. This is considerably greater than the output of the 160,000-kw., 160,000-kva. generator in the East River station of the New York Edison Co. The units are said to be the largest single-shaft machines operating at 1,800 r.p.m. Without auxiliaries or attachments, the combined weight of each turbine-generator unit will be over 1,000 tons. The turbines are designed for steam conditions of 400-lb. gage pressure, 730 deg. F. total temperature and 1-in. absolute back pressure. Approximately 800 tons of steam per hour will be delivered to each through two 22-in. steam lines. In each generator the steel portion of the revolving field will weigh approximately 185,000 lb. About 18 tons of copper strip will be required for the field winding. A special railway car will be required to ship the motor which will have a net weight of almost 150 tons. As the stator will exceed shipping limitations in both weight and size, the stator frame will be made in halves, to be assembled in the power station.

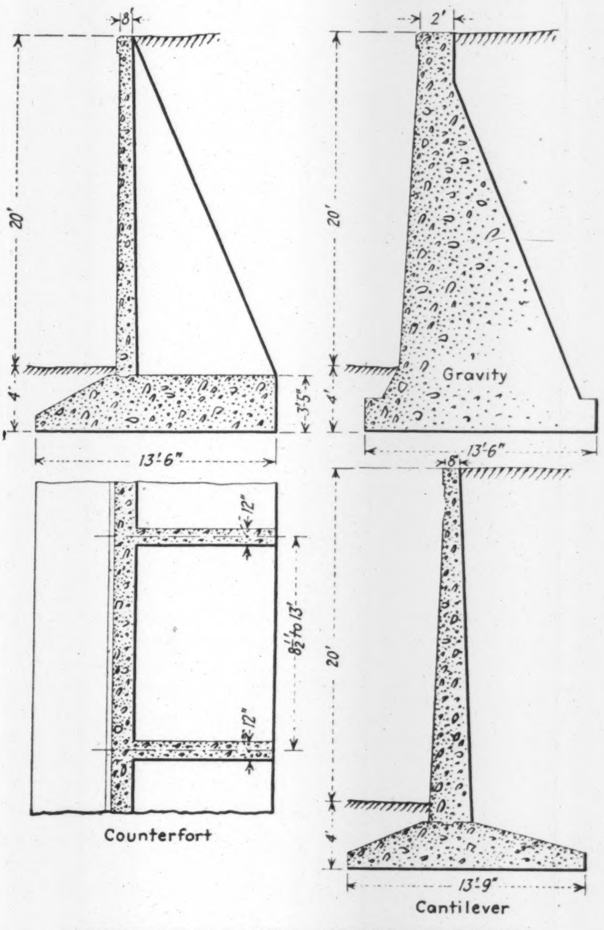
Retaining Wall Costs Compared

Comparison of Design Shows Economy of Cantilever Type for 20-Ft. Height—Table of Costs Given

IN DESIGNING a 20-ft. retaining wall in connection with an industrial development, the principles of cost analysis were applied to gravity, cantilever and counterfort sections in order to determine the most economical of these types under the given conditions. Although preliminary analysis of the latter type indicated that the most economical spacing of counterforts would be about 10 or 12 ft. on centers, in order to determine this closely four designs were developed with spacings of 8½, 10, 11 and 13 ft. on centers. For all types the walls were designed with a surcharge of 500 lb. per square foot. Lateral pressures were determined by Rankine's theory, the weight of earth being taken at 100 lb. per cubic foot and the angle of repose as 30 deg. Limiting unit stresses for concrete and steel were those specified by the 1924 Joint Committee: for steel, 18,000 lb. per sq.in. for main tension reinforcement and 16,000 lb. per sq.in. for shear reinforcement; and for concrete, 800 lb. per sq.in. for extreme fiber-stress in compression. The walls were so proportioned that the full width of the base is always under compression and, with maximum lateral pressure, the unit compression is zero at the heel. At the toe the maximum compression per square foot would be approximately 6,000 lb. for the gravity wall, 4,000 lb. for the cantilever wall and 4,400 lb. for the counterfort type.

COST OF 20-FT. RETAINING WALL PER 100-FT. SECTION

	Gravity			Cantilever			Counterfort								
								8½ Ft.		10 Ft.		11 Ft.		13 Ft.	
	Unit Cost	Quantity	Amount	Unit Cost	Quantity	Amount	Unit Cost	Quantity	Amount	Quantity	Amount	Quantity	Amount	Quantity	Amount
General excavation, cu.yd..	$1.25	259	$324	$1.25	263	$329	$1.25	263	$329	259	$324	259	$324	259	$324
Backfill, cu.yd.	.75	1,053	790	.75	1,430	1,072	.75	1,385	1,039	1,388	1,041	1,382	1,037	1,367	1,025
Concrete, cu.yd.	11.00	576	6,336	12.00	226	2,712	12.00	219	2,628	223	2,676	231	2,772	247	2,964
Forms, sq.ft.	.33	5,263	1,737	.33	4,653	1,535	.35–.38	6,886	2,617	6,452	2,387	6,327	2,278	5,963	2,087
Reinforcing steel, tons.	.....	.....	.....	80.00	14	1,120	80.00	10.67	854	10.7	856	10.77	862	11.05	884
Carborundum rub (face)....	.06	2,000	120	.06	2,000	120	.06	2,000	120	2,000	120	2,000	120	2,000	120
Administrative expense, lb. (6%).	.....	.....	558	.....	.....	414	.....	.....	455	.....	444	.....	443	.....	444
Total cost..	.....	.....	$9,865	.....	.....	$7,302	.....	.....	$8,042	.....	$7,848	.....	$7,836	.....	$7,848
Cost per foot.	.....	.....	$98.65	.....	.....	$73.02	.....	.....	$80.42	.....	$78.48	.....	$78.36	.....	$78.48



TYPES OF RETAINING WALLS COMPARED
A, Counterfort; *B*, Gravity; *C*, Cantilever.

Detailed costs for each of the six designs are shown in the table. In preparing these estimates, excavation was taken only for the base of the wall below grade at the face. Backfill, in each case, was figured to a vertical line 18 ft. inside the face of the wall. As a 100-ft. length was used as a base, the counterfort design estimates include fractional counterforts to make the figures comparable. Formwork for the gravity and cantilever types, being comparatively simple, was estimated at 33c. per square foot; for the counterfort design it was assumed that the more complicated forms for the back of the wall would add 2c. per square foot in the case of the 13-ft. spacing and an additional 1c. per square foot for each closer spacing.

The high cost of the gravity section is due to the much greater yardage of concrete, which more than offsets the saving in steel, although the leaner mixture of concrete in this design has been carried at a slightly less cost than in the others. It is possible that the cost could be further lessened by the use of cyclopean concrete, if stone is available at low cost and with minimum handling.

In the four counterfort designs it is interesting to note that the weight of reinforcement is approximately the same for all spacings considered and that, as the number of counterforts increases and the thickness of the stem decreases, the concrete added in one case approximately offsets that saved in the other.

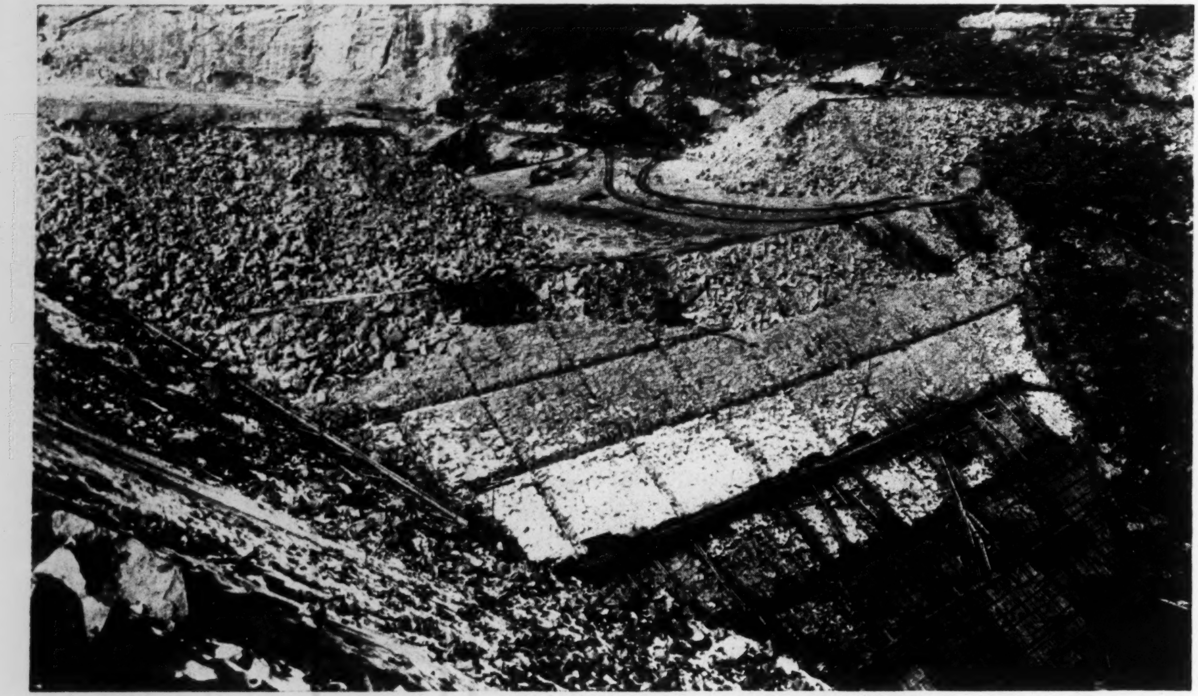
This study was developed by the engineering division of the Morton C. Tuttle Company under the direction of H. A. Gray, assistant chief engineer.

North Carolina Road Progress

During the fiscal year just ended, the North Carolina highway department added 540 miles to the state highway system, bringing the total to 8,962 miles. There are 16 miles of bridges in the state system, and 230 miles of the system are inside corporate limits of towns.

Construction Methods on the Salt Springs Rockfill Dam in California

More Than 3,000,000-Cu.Yd. Fill of Quarried Rock Placed at Rate of 125,000 Cu.Yd. a Month—Upstream Slope Paved With 15-Ft. Layer of Placed Rock Surfaced With Concrete Slab



CONVERTED POWER SHOVEL DERRICKS BUILD PLACED-ROCK SECTION
Railroad tracks on level of main quarry seen in left background. Concrete-facing work under way.

QUARRYING and moving 125,000 cu.yd. of granite a month into the Salt Springs dam for a period of two years is the schedule being maintained by the construction department of the Pacific Gas & Electric Co., San Francisco, in building this record-breaking rockfill structure. In addition to dumping the total of almost 3,000,000 cu.yd. into the fill, 220,000 cu.yd. of this rock is rehandled piece by piece to build the placed-rock section on the upstream face. The other major operation consists of pouring 30,000 cu.yd. of reinforced-concrete slab on the placed rock to form the upstream facing. This heavy construction program is made especially difficult by the fact that the site is accessible only by truck. Materials must be hauled 50 miles from railhead, with most of this haul over a construction road.

Dam Structure and Location

The dam, located about 70 miles northeast of Stockton, Calif., will provide 130,000 acre-ft. of storage as part of an extensive power-development program that contemplates utilizing practically all of the economic power possibilities on the Mokelumne River. The major feature of this program is the proposed Tiger Creek plant of 60,000-kva. capacity that will use the natural flow of the river, augumented by the Salt Springs storage delivered through an 18-mile conduit. This conduit line and the power house will be built during the latter part of the dam-construction period, thus completing both parts of the work concurrently in 1931.

In general, the dam is similar to other modern structures of this type, but its unprecedented size brought new problems in design and construction. The dam is 328 ft. high above the lowest foundation and has a crest length of 1,300 ft. The design calls for a downstream slope of 1 on 1.4, and if the natural run of the fill is steeper than this, berms will be provided to secure this average slope. The upstream face has an average slope of 1 on 1.3 and is finished off with a derrick-placed rock facing 15 ft. thick, measured perpendicularly to the slope. Grooves at 60-ft. intervals each way are provided in the placed rock and filled with concrete to form ribs under the edges of the joints in the reinforced-concrete facing. This facing slab, covering the entire upstream face, varies in thickness from 3 ft. at the bottom to 1 ft. at the crest and is poured in sections 60 ft. square with expansion joints and copper water stops along the edges of the sections. The general features of the design are shown in the accompanying section; the details, including a description of the provisions to care for settlement, were discussed in an article in *Engineering News-Record*, Jan. 16, 1930, p. 92.

The dam site is approximately 50 miles from the railway, 40 miles from existing electric-power lines and about 30 miles from the highway. This inaccessible location was a large factor in the decision to select a rockfill dam and it also has influenced many of the methods employed in construction. The small tonnage to be transported did not warrant the expense of a railroad and made necessary the trucking of all equipment and supplies.

To provide the quickest possible access to the site, a temporary road was constructed during 1926 and 1927 from the main highway. This route had a maximum elevation of about 6,500 ft. and because of snow conditions was not feasible for winter transportation; later on, a better location was substituted for that part of the route at high elevation. This new location lowers the maximum elevation to about 4,500 ft. and approximately parallels the proposed new conduit line and will be useful during its construction.

About 20,000 tons of material for the dam will be hauled from railhead under a separate trucking contract. Because of this heavy trucking, which will continue through a three-year period, it was considered economical to provide a crushed-rock surface. Several quarries were opened along the route and more than 50,000 cu.yd. of crushed rock was spread on the road. Grades along the lines were limited to 8 per cent with the exception of a few short stretches of 10 per cent grade in the direction of the loads.

Power for camp and construction purposes was provided by building a 40-mile transmission line from the nearest point on the company's system. The line is 60,000 volts for the first 25 miles to the proposed powerhouse site and there is stepped down to 17,000 volts for transmission to the dam site. The reduction in voltage was provided to facilitate tapping the line for construction purposes along that portion near the road and conduit lines.

The camp accommodates a crew of approximately 500 persons. Lumber for camp and construction uses was cut by a sawmill erected near the site. The housing facilities include bunk houses for twenty men each, a dining hall, offices, shop and other usual camp buildings, all situated on the steep canyon side directly below the dam. The wage scale for common labor is 50c. an hour, with a charge of $1.25 per day for board and room, the company furnishing cots and mattresses but not blankets. Water supply is obtained from the river some distance upstream from the dam and is pumped to tanks above the camp to provide a pressure system. All waste water and sewage before returning to the stream passes through a disposal plant consisting of a settling tank, a trickling filter and a large bed of fine sand.

The almost exclusive use of electric power for camp and construction work is because of the fact that it is available from the company's own system and because fuel costs at the site would be extremely high. The total installed capacity is about 4,000 hp. No central substation is maintained at the site, but the transmission line is tapped and transformed to 2,300 volts for major power installations. The largest of them is the main compressor plant, consisting of three compressors, two driven by 300-hp. motors and one by a 150-hp. motor. Air is piped to all construction work around the dam.

Preliminary Construction

A timber-crib diversion dam and a 19-ft. tunnel under one abutment (to be used later for the main outlet from the reservoir) constituted the first actual construction work. The tunnel is about 1,200 ft. long and is lined for 900 ft. with unreinforced concrete. The lined section was grouted at 100 lb. pressure 60 days after pouring.

Stripping the dam site to bedrock preceded placing the rockfill. The excavation totaled 310,000 cu.yd. and was carried on by power shovels and trucks. About 67,000 cu.yd. of the boulders excavated was used as fill in the dam, but the gravelly material was removed from the site and used for leveling at the camp.

MAIN QUARRY EXCAVATION, SHOWING SHOVELS AND TRAINS

Two 4-yd. electric shovels and railroad equipment have record monthly output of 111,600 cu.yd. Note solid granite formation.

A cutoff trench 6 ft. wide with a maximum depth of 20 ft. was excavated in solid granite all along the upstream toe. Filled with concrete, this vertical cutoff constitutes an extension of the facing on the upstream slope. Reinforcing dowels were provided at the angle. Pipes were embedded in the wall at 6- to 10-ft. intervals and through them holes for grouting will be drilled 50 ft. into bedrock. This preliminary work was required before full-scale construction work could start, but during this period the main quarry was being opened and dumping was proceeding slowly.

Quarrying and Placing Rockfill

Rock for the fill is obtained from three main quarries at different levels near the north abutment of the dam and from the spillway excavation on the south bank. The largest of these quarries was started at an elevation about midway between streambed and the dam crest and was planned to provide 1,300,000 cu.yd. The volume of rock removed from all quarries averaged more than 126,000 cu.yd. a month from May to October, 1929; the maximum monthly output of 140,880 cu.yd. was in June. Loading during this record month was done with two 4-yd., one 1¾-yd. and one 1-yd. electric shovels. Work in the quarries is carried on two 8½-hour shifts per day.

Quarrying methods in the main quarries follow, in general, usual practice and feature the breaking down of large volumes of rock with big shots. The major charges for such shots are placed in a row of vertical holes put down by electrically operated well-drilling rigs about 30 to 45 ft. back from the face of the quarry. The depth of these holes ranges from 60 to 180 ft., depending on the height of the quarry face, and they are spaced approximately 20 ft. apart. Horizontal holes are provided to receive the charges along the bottom. The two major shots in the main quarry required about 50 tons of dynamite apiece and brought down approximately 200,000 cu.yd. of granite at each shot. Material too large to handle is reduced by drilling with jackhammers and further shooting.

Excavation in the largest quarry is by two 4-yd. electric shovels loading into 30-cu.yd., standard-gage, drop-door railway cars. The shovels handle rocks up to about 12-cu.yd. size and load, on an average, about 850 cu.yd. per shovel per shift. The output from the two shovels in this quarry averages about 92,000 cu.yd. a month, with a maximum of 111,600 cu.yd. These yardage figures do not include waste, which amounts to about 5 per cent of the total rock removed and consists of fines and soil, the small amount indicating the excellent quarry conditions.

In one- or two-car trains, loads are moved by 20-ton storage-battery locomotives from the quarry to the fill, a distance of about 2,000 ft., on track with 70-lb. rail; 60-lb. rail was used at first but proved too light for the heavy hauling and the uneven roadbed. The track at main-quarry level extends out onto the fill in the form of a loop, and as dumping progresses at both faces and along the axis of the dam, the loop is widened and moved forward out into the canyon. A mechanical track mover is used to shift the track in the quarry and on the dump.

At the upper quarry level the narrow fill does not permit a track loop. This resulted in the development of an end-dump body operated by a telescoping hydraulic hoist on a standard-gage railroad-car frame. With this device the fill may be extended out into the canyon without the use of a trestle while the drop-door cars are used for widening. This plan and the operation of the end-dump car have proved very successful.

The rather unusual feature of using storage-battery electric locomotives of large size in such a remote location was prompted by: (1) the low unit cost of electrical energy because of the large size of the power installation on the project; (2) the fact that the equipment was on hand from previous construction work; and (3) the remote location, making fuel costs extremely high.

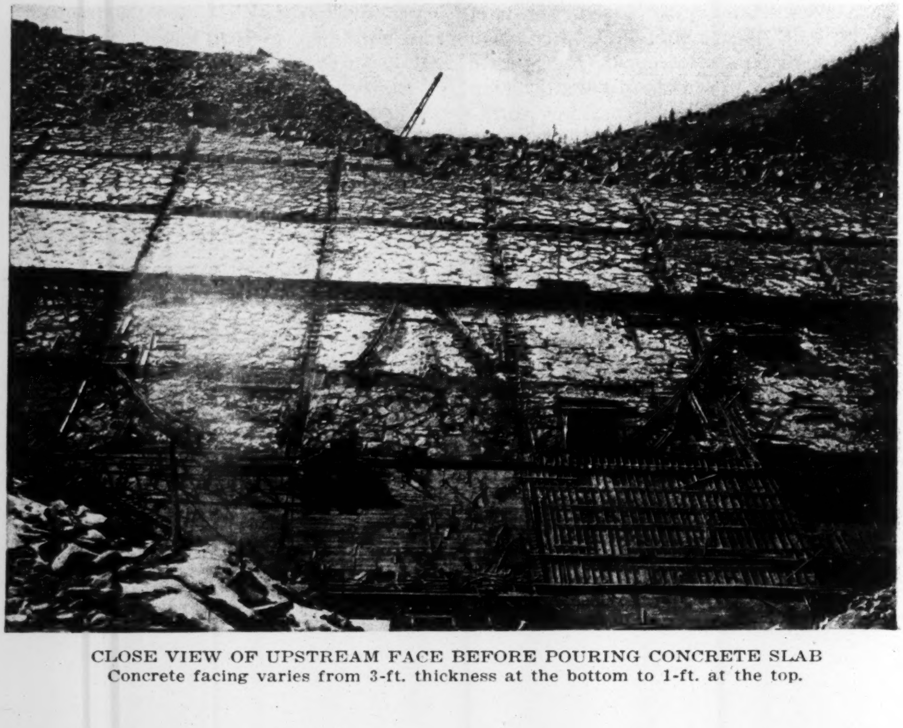
Extensive rebuilding was necessary to provide locomotives of adequate size from available equipment of 7-ton, 36-in. gage, storage-battery units previously used in tunnel construction. Two of these small locomotives were combined and reassembled to form one 20-ton standard-gage unit. The two old controllers were connected by a chain so as to operate together, and an air compressor was installed to provide air for dumping the rock cars. Enough battery capacity is provided to operate for a shift; extra sets are recharged in a charging house equipped with voltage regulators to provide automatic operation during a six-hour charging period.

Rock dumped along the downstream slope and over the end of the fill is allowed to roll to its natural slope. The angle of repose of the dumped rock averages about 1.35 horizontal to 1 vertical; berms will be required to provide for the 1 on 1.4 downstream slope called for in the design. However, as no attempt will be made to trim the berms, the rock from the lift above probably will roll over most of each berm, the intention being merely to assure the required slope. Rock-rolling down the upstream face is used in the derrick-placed section that is carried up from below. Care is taken to have the fill roll as close as possible to the placing operations so as to reduce rehandling. All rock is washed with streams of water as it is placed in the fill.

Placed-Rock Facing

The placed-rock section is built by crawler-mounted cranes converted from $\frac{3}{4}$-yd. power shovels. Wire-rope slings are used to pick up and place rocks up to 10-ton size. A line attached to the lead block is operated from a power drum and speeds up the work of placing by providing faster motion than the usual way of raising or lowering the boom. Large rocks are set with derricks, the outer layer with one face on the line of the slope and smaller rocks are placed by hand to chink in the spaces. This process builds up a solid backing and a relatively even surface for the concrete facing slab. The method of work and the results are well shown by the accompanying illustration.

Speed in building up the placed-rock section is the governing factor in constructing this type of dam. At the beginning of the work the short length across the face allowed room for only two derricks. As the work progressed the increasing width permitted the economic



CLOSE VIEW OF UPSTREAM FACE BEFORE POURING CONCRETE SLAB
Concrete facing varies from 3-ft. thickness at the bottom to 1-ft. at the top.

use of additional derricks until five were in use with the work half way up to the crest. The depth of the section is 15 ft. measured perpendicular to the upstream face, and the yardage is 220,000 cu.yd. Under favorable conditions, each derrick is able to place about 3,000 cu.yd. per month working two shifts with a crew of six men per shift.

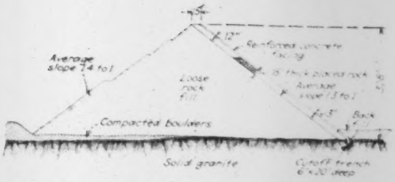
Constructing the Concrete Facing Slab

The reinforced-concrete slab covering the upstream face varies in thickness from 3 ft. at the bottom to 1 ft. at the crest, and each 60-ft. square panel is poured in one continuous operation. This requires a concrete plant of large capacity using aggregate produced at the site because of transportation costs.

A modern crushing and screening plant was built at a point high up on the south side of the canyon, upstream from the dam, to produce four grades of aggregate. The bunkers were arranged to discharge into the proportioning and mixing plant, and the steep slope permitted gravity operation for the entire process. Granite is quarried at the level of the upper end of the plant and brought by small cars to a 20-in. grizzly that feeds the primary jaw crusher. The product of this crushing is screened into four grades of aggregate with maximum sizes of $\frac{1}{4}$, $\frac{3}{4}$, $1\frac{1}{2}$ and $2\frac{1}{2}$ in. and goes by chutes to the bunkers. The rejects are run through secondary and tertiary gyratory crushers, screenings in each case going to the bins. A sand-making machine at the lower end of the system is used to make up any deficiency in fines from the previous crushings.

CLOSE VIEW OF REINFORCING FOR FACING SLAB
Concrete poured against derrick-placed rock, with maximum size of 10 tons; continuous pour for each 60x60-ft. panel.

The aggregate from the bins discharges directly into weighing hoppers directly above a 1-yd. mixer. An inundator is not used for the sand, because the moisture content in the material fresh from the quarry is low and quite uniform. Cement is measured by the sack and is dumped into the batching hopper with the aggregate. Water can be heated during the winter months with steam and is measured into the mixer by disk water meters. Although conveying is done entirely by gravity, a total of 420 hp. in electric motors is required to operate the various units of the plant.



SECTION AT MAXIMUM HEIGHT OF SALT SPRINGS ROCKFILL DAM

The concrete is hauled in cars by a cable to a point opposite the face and run in chutes to a hopper on the upstream slope, where it is distributed by 2-yd. cars to the point of pouring. The first three horizontal rows of 60-ft. facing panels above the vertical cutoff wall were poured behind wood forms 3 in. thick. These were left in place as added protection and waterproofing below outlet elevation. The forms were secured to the concrete by driving twenty-penny copper nails through the inner layer of $1\frac{1}{2}$-in. planks so as to project into the concrete and then spiking the outer planks to the inner. Above this elevation, sliding steel forms will be used in pouring the slabs.

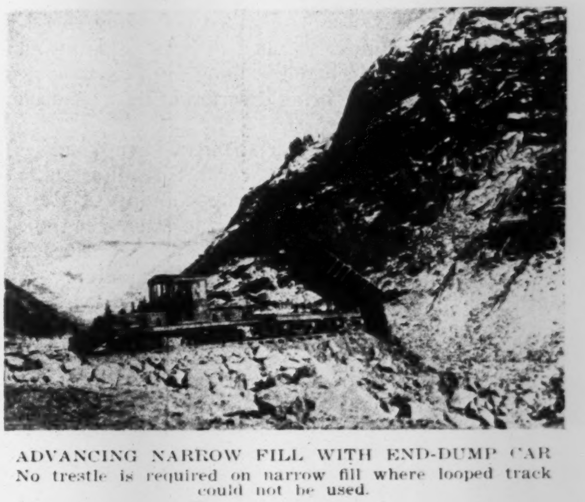
These steel forms will be 8 ft. wide and 62 ft. long, with structural steel trusses to maintain an even surface across the 60-ft. panel length to be poured. The weight of the form is sufficient to hold it against the headers, and winches are provided to raise it during the pouring operation.

Spillway Construction

A spillway is being excavated in solid rock around the south abutment. About 500,000 cu.yd. of rock required removal and is used in the dam. After shooting, the rock is loaded by two 2-yd. electric shovels into 9-cu.yd. tractor-drawn crawler trailers for transporting to the dump. Each of the shovels works two shifts and averages about 18,000 cu.yd. per month, the output being reduced because of the restricted operations in the small area of the spillway. The large tractor-trailer units were selected as most suited to the rough usage with short haul and excessive turning, since railroad equipment was not practicable in the confines of the small quarry. These trailers were described and illustrated in *Engineering News-Record*, Oct. 17, 1929, p. 616.

Organization

A. H. Markwart, vice-president in charge of engineering, Pacific Gas & Electric Co., is responsible for the major engineering features of the project. Construction work is under the direction of O. W. Peterson, engineer of general construction, with Hector Keesling as principal assistant. Construction in this field is in charge of P. I. Kurtz, resident superintendent, and R. D. Reeve, resident engineer.



ADVANCING NARROW FILL WITH END-DUMP CAR
No trestle is required on narrow fill where looped track could not be used.

Quick-Hardening Cement Simplifies Detour Problem

Mountain Districts in North Carolina Where Detours Are Difficult Keep Traffic Moving by Using Special Cement

An ORGANIZED practice in the use of high-early-strength cement for closing gaps in pavement over approach fills and for repairing pavement breaks has been developed by the North Carolina department of highways. The pavement is laid in two strips—half the road width at a time. The forms are set for the first half-width strip, which is poured while the traffic is maintained over the fill on the other half of the roadway. In 36 hours the traffic is turned over the first half-width strip and the second strip is poured.

The handling of the details of a job of this sort in the mountainous section of the eighth district of the department is typical of the practice adopted. A maintenance gang is stationed in a camp of portable houses on the project and works up to 20 miles each way from this point. This gang has all-portable equipment which can be hauled by motor trucks. The sand and stone for the concrete are delivered in advance in piles close to each gap. The cement is brought in as required.

FIRST STRIP REPLACEMENT OF SLAB DESTROYED BY A LANDSLIDE

A one-bag mixer on four rubber-tired wheels is set up on the slab at one end of the gap. The mixer is charged and the concrete is delivered to place with wheelbarrows. As soon as the first strip is finished the mixer is shifted to the next gap, and so on until the first strip on all of the gaps is placed. Then the gang returns and closes the second strip, traffic being diverted in the meantime to the first strip.

The bridge gangs of the department have developed a fine technique on this kind of work. Special attention is given to the accuracy of the proportioning of the materials and to the measurement of the water for the concrete. To this end a homemade, crude, but effective inundator has been developed. This inundator consists essentially of a tight metal-lined box of measured capacity mounted on an iron-rod trunnion having a crank handle bent onto one end. This trunnion is set in the box eccentrically so that the crank has to be used to dump the load. About the right amount of water to saturate the sand is first poured into the box. Then the box is filled with sand and enough water added to complete the saturation.

HOMEMADE SAND INUNDATOR BEING DUMPED

Since all of these jobs are of quite limited yardage, the water for the concrete is drawn from the stream by hand. By using buckets of measured capacity it is possible to keep very close to the correct water-cement ratio.

Before laying the second strip special care is taken to clean the exposed faces of the previously placed concrete at the joints. A man also removes all of the loose material and dust from the adjacent surface of the slab with a long-bristle, flexible paint brush. On account of traffic on the first strip, this brushing usually has to be done frequently while pouring is under way.

Working thus accurately, the department has been able to close gaps in the pavement slab without perceptible variation in the surface of the completed joints. These are filled with the standard compound used in maintaining cracks in the slab.

John D. Waldrop is state highway engineer of North Carolina, W. L. Craven is bridge engineer and H. E. Noell is engineer of the eighth district.

Building in Two Zones Requires Special Treatment

The 58-story office building being erected at the corner of 42d St. and Fifth Ave., New York City, is located in two different zones and therefore presented unusual complications in setback treatment. According to statute, in the Fifth Ave. zone the building can rise without setback from the sidewalk to a height $1\frac{1}{4}$ times the width of the street, while in the 42d St. zone the building can rise twice the width of the street. The building has a frontage of 100 ft. 5 in. on Fifth Ave. and a depth of 208 ft. 4 in. on 42d St. The problem was solved by developing one unit 100 ft. 5 in. on Fifth Ave. and 100 ft. deep under one zoning regulation and another unit with a frontage of 108 ft. 4 in. on 42d St. and with a depth of 100 ft. 5 in. as the second unit. The first setback on the Fifth Ave. side occurs 125 ft. above the street, while on the 42d St. side the first setback is 200 ft. above the street, both Fifth Ave. and 42d Street being 100 ft. wide. Since the zoning laws permit the tower to occupy only one-fourth the area of the plot above the finished setbacks, the Fifth Ave. side was set back 2 ft. for every 5 ft. of height, while the 42d St. side sets back 1 ft. for every 4 ft. of height. The tower occupies space in both units, with a little more than half of its area in the 42d St. unit. The setbacks are located at the 18th, 22d and 25th floors on the Fifth Ave. side and at the 23d, 28th and 34th floors on the 42d St. side. Shreve, Lamb & Harmon are the architects for the building, which is being built by Walter J. Salmon.

Loading Heavy Levee Machines for Barge Transportation

Barge Shipment Intact of Dragline Excavators and Cableway Towers Calls for Careful and Precise Procedure to Avoid Accidents

By J. C. French
Sales Manager, Monighan Manufacturing Corp., Chicago, Ill.

Barge transportation by river is the nearly universal method of shifting heavy levee-construction equipment from one operation to another on the Mississippi. It permits generally closer approach to the working site than any other means, and it also enables shipment of large units, such as dragline excavators and the towers of slackline cableway excavators, without dismantling them. The loading of heavy equipment units on barges and unloading them from barges to riverbank involve hazards and are tasks which the contractor must be prepared to carry out quickly and safely. In this article some of the conditions which prevail and some of the practices which experience has shown to work well are outlined.

Barges and Towing Equipment

The barges on the river are generally owned by the government or by private towing companies, but in some instances the levee contractors have purchased their own equipment in order to eliminate the delays and uncertainties of renting. Contractors who own barges generally arrange to keep them rented when not in use. An average charge is $35 a day for a 1,000-ton barge. The government has barges of various tonnages for transporting government-owned equipment and the district offices rent these barges to contractors when they are not in government use. If required, a towboat is furnished to complete the move. Barge dimensions vary, but shallow draft is very important, as it is necessary to approach the riverbanks closely in order to reduce the timbering between barge and bank. All-steel, deck-type barges are required and the following are approximately the standard sizes for river use: 100x26x6½ ft.—400 tons; 130x30x7½ ft.—700 tons; and 160x39x7½ ft.—1,000 tons.

With the coming of the larger levee work under the flood-control act of 1928, larger excavating machinery has been employed, and its barging presents a problem. None of the present government barges has the capacity singly to handle 300-ton dragline excavators, and the engineers have resorted to lashing two of the smaller barges together and arranging the track of the truck-type machines so that one track line is located centrally upon each barge.

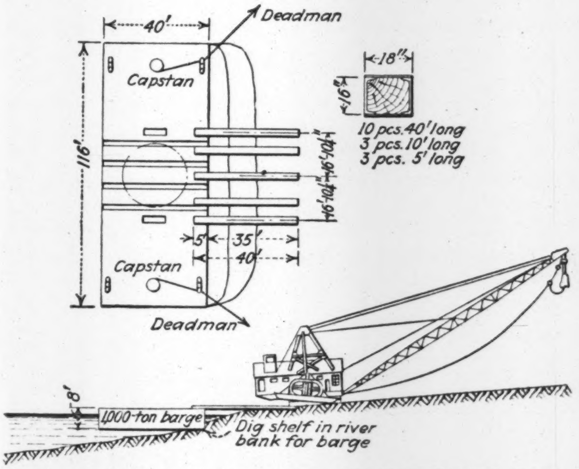


FIG. 1—BARGE PLACEMENT AND TIMBERING FOR LOADING WALKING DRAGLINES

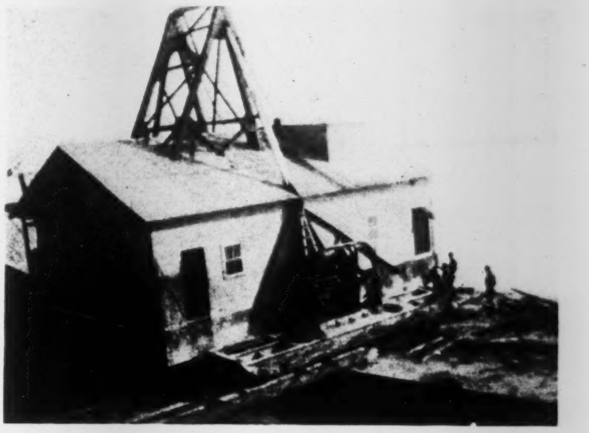


FIG. 2—WALKING DRAGLINE ENTERING ONTO BARGE

Loading Truck-Type Draglines—Truck-type draglines are generally loaded over the end of the barge moored head on to the bank. A ledge or shelf is excavated in the bank to support the end of the barge and make possible a rigid span from bank to barge. The weight concentrated on the trucks necessitates extreme care in avoiding a track jump at the intersection if the timbering is not rigid.

Guy lines extending from deadmen on the shore to various points on the barge hold it against the river current. These lines are generally set at a decided angle from the barge to the shoreline. During loading or unloading it is generally the practice to station one man at each deadman to warn of any signs of loosening. Any unknown loosening of the deadmen would immediately affect the entire process and extreme danger would result.

It is always necessary to block the trucks firmly upon the rails to prevent any slipping or sliding of the wheels. It is also necessary to fasten the rail sections rigidly to the barge deck to prevent any movement sidewise. The wave action resulting from a passing steamer tends to shift the load of these heavy machines.

Loading Walking-Type Draglines—The barge is placed sidewise against and onto the riverbank by excavating a ledge for the side of the barge to rest upon. This ledge (Fig. 1) is generally dug about 3 ft. wide with the dragline. The barge is placed in position, either by towboat or by capstan lines from deadmen on the shore. The dragline is loaded over the side of the barge, although endwise loading can be carried through successfully if bank conditions do not allow sidewise loading. Sidewise loading shortens the critical period in transferring the machine weight from the shore to the barge as the center of the barge is close to the edge of the bank. The long safety ledge also distributes the weight of the machine over a greater area than in endwise loading, and the danger of a slip is greatly lessened.

It is extremely important to have the barge guy lines lead out at 45 deg. to the riverbank and firmly attached to the deadmen. These lines control the position of the barge at each end and are used to place it in position for the transfer. Extra guy lines are advisable for safety in the event of a break of the main guys. These safety guys are generally placed directly upbank at right angles from the barge and tend to aid the 45 deg. guys when the actual weight transfer is made.

The timbering shown in Fig. 1 should be of the dimensions shown for proper and safe results, but if the sizes are not obtainable on the particular location, freshly cut logs are sometimes used. These are generally obtained from the clearing of the levee project, and if placed in a continuous matting and of the proper size for strength, they will serve the purpose. The logs must not be less than 8-in. timber and larger, if possible to procure. If smaller sizes have to be used, it is advisable to crib up under the approach to insure safety.

The timbering upon which the machine rests while in position upon the barge is important, as it forms the basis of the track for the unloading operation, which is the reverse exactly of the loading process.

The actual loading and unloading time depends upon the location conditions, but there are many cases under average conditions where large machines have been loaded in twelve hours, and in some cases when conditions were ideal, machines have been loaded in eight hours. This time includes all preparations, placing the timbering, guy lines, etc., and illustrates the ease of the operation when the plan is thoroughly considered beforehand. No heavy machinery loading or unloading is a simple matter and the element of danger is always to be considered, but if every detail is prepared the uncertainties are reduced to a minimum.

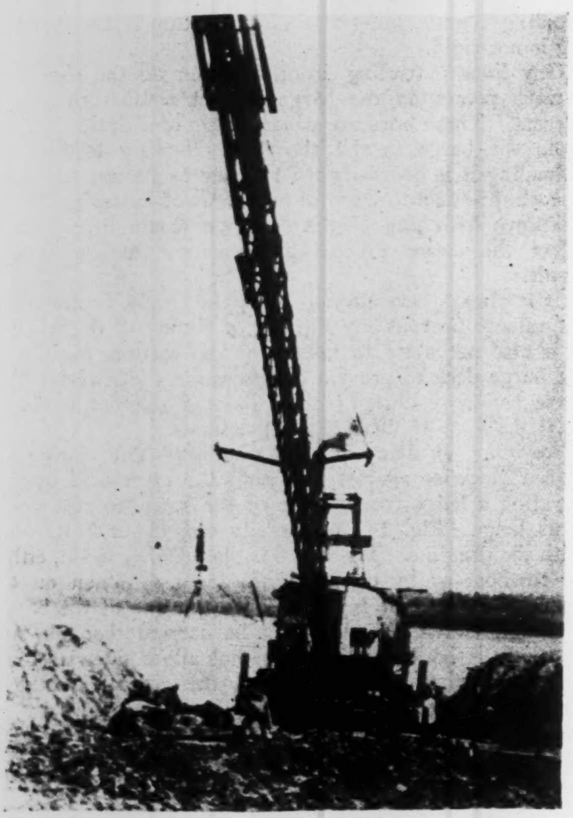


FIG. 3—TRUCK-TYPE DRAGLINE WORKING DOWN-BANK TO BARGE

The dragline is picking up a track section from behind to swing it ahead for further advance. A downbank ramp has been previously excavated by the dragline.

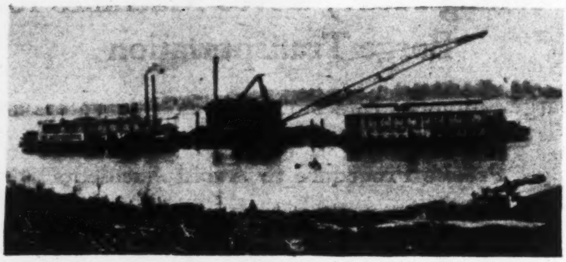


FIG. 4—MAKING UP A DRAGLINE TOW WITH QUARTERBOAT

Loading Tower Excavators—The loading and unloading of tower excavators is somewhat more simple than is the loading or unloading of either truck or walking draglines, as they are usually mounted upon crawlers. But the heavy units are multiplied by two for each installation and the actual transfer occupies about the same time. The timbering for the crawler approaches has to be thoroughly studied to suit the location and every detail considered as carefully as for the other machines.

Advantages of Sectional Dredges for Mississippi Levees

Built in Sections for Land Transportation and Job Assembly, They Have Demonstrated Their Practicability

By V. J. Milkowski
Engineer, Morris Machine Works, Baldwinsville, N. Y.

CAREFUL reading of the several articles by C. S. Hill (*Engineering News-Record*, Jan. 17, 24 and 31, 1929, and Feb. 6, 1930) on levee construction on the Mississippi impresses the writer strongly with the many favorable opportunities for the application of hydraulic dredges in that work. Their limited use so far in comparison with these opportunities appears due (1) to unfamiliarity of engineers and contractors generally with the latest improvements and developments in the field of hydraulic dredging and (2) to lack of consideration, in levee design and in levee structure, of the distinctive characteristics of hydraulic-fill embankment.

The impression is common that a hydraulic dredge is a large, expensive piece of floating equipment applicable only in navigable waters and not to be compared in transportability and general usefulness with other large excavating equipment, such as draglines. Formerly, this was in a large measure true, but it is not true in the light of recent suction-dredge developments. By using electric drive and building the hull in sections, a hydraulic dredging plant can be built at comparatively low cost and can be transferred from one borrowpit to another about as readily as other heavy excavating equipment.

The sizes of dredges which lend themselves best to this class of work are 10,- 12- and 15-in. machines. They should be equipped with cutters and with spuds and, as mentioned above, should be electrically driven. The principal characteristics of such dredges are summarized in the accompanying table.

Figs. 1 and 2 illustrate the 10-in. dredge as described, and Fig. 3 shows a 12-in. dredge built along similar lines, but with the hull made of one pontoon 100x18x7 ft.

CHARACTERISTICS OF SECTIONAL DREDGES SUITABLE FOR MISSISSIPPI LEVEE WORK

Size	10-in	12-in.	15-in.
Capacity 10 per cent solids, cu.yd. per hr.	90	125	200
Digging depth, ft.	25	30	36
Pumping distance 20-ft. lift, ft.	1,500-1,700	1,800-2,000	2,500-2,800
Electrical horsepower	240	360	650

The 10-in. dredge has hull in two 9x45x5-ft. sections weighing 34,000 lb. each.

The 12-in. dredge has hull in two 11x52x5½-ft. sections weighing 42,000 lb. each.

The 15-in. dredge hull has one 12x55x5½-ft. section weighing 40,000 lb. and two 9x70x6½-ft. sections weighing 45,000 lb. each.

10 in. and two cylindrical pontoons 6 ft. in diameter and 60 ft. long. This particular dredge was originally installed at St. Cloud, Minn., and upon completion of the work was dismantled and shipped by rail to East St. Louis and reassembled there and put into operation. Less than a month elapsed between the time the dredge was shut down at St. Cloud, Minn., and the time it was ready to run again at East St. Louis, Ill.

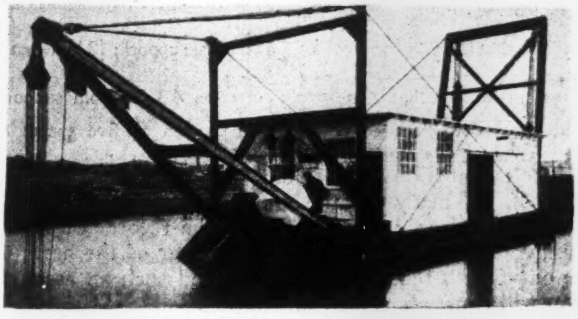


FIG. 1—HYDRAULIC DREDGE WITH TWO-SECTION HULL, NEW HAVEN, CONN.

Considering the application of such dredges in levee building, there are too many possible methods and combinations to permit discussion except by a typical example. A combination of hydraulic dredge and a dragline-excavator operation is shown in Fig. 4.

The first step is to throw up embankments 1 and 2 for retaining the hydraulic fill, embankment 3 to be dredged with a hydraulic dredge from borrowpit 3. Borrowpit 1 could be filled with fines escaping through the overflow and would, therefore, not need to conform to the present requirements and restrictions as to location and depth. The levee would have to be finished to the final height and form by means of the dragline.

A levee built in this manner would be tighter and more solid than a levee built by ordinary dry methods. By using shutter pipe and by making the fill from the side toward the center, the material deposited in the center would be fine and impervious, so that the levee would in effect have an impervious core wall of fine material reaching from near the top down below the original surface into borrowpit 2. Such a levee is in effect a hydraulic-fill dam, and must be reasonably free from any possibility of failure through seepage and undermining.

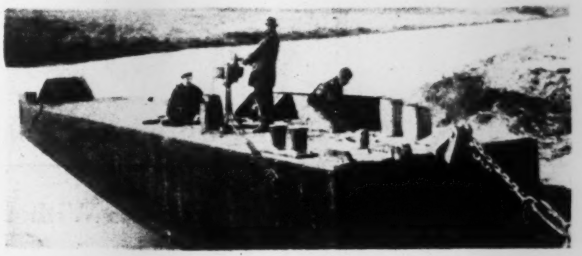


FIG. 2—ONE OF THE HULL SECTIONS OF THE NEW HAVEN DREDGE

It might be in place to suggest here that some of the present restrictions as to the depth and location of borrowpits can be modified with hydraulic dredging, as any material taken out can be replaced with a hydraulic fill, which would be as solid and tight as the original bank. It should also be permissible with hydraulic-fill levees to use a steeper slope on the back, or the land side, as the impervious core wall of fine material would either eliminate seepage entirely or make the slope of the seepage line much steeper than is expected at present.

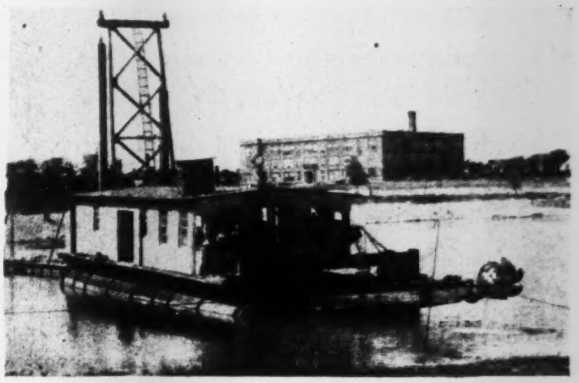


FIG. 3—DREDGE WITH THREE-SECTION HULL, MINNEAPOLIS DREDGING CO.

The question may be raised as to how readily the dredge can be dismantled and reassembled. By making the pontoons of steel and in sections as suggested above, by building the deck house in sections and by making suitable provision in the wiring, etc., the whole dredging plant can be moved just as readily as any type of construction plant of corresponding magnitude. The objection that such a dredging plant must be electrically driven is not valid. Where power is not available from central stations, it will be far more economical for the contractor to install a central generating plant, preferably diesel-driven, at some convenient point and to operate all of his plant units electrically. This method of drive is being adopted on large contracts with other types of equipment, on account of the flexibility and the dependability of electric power.

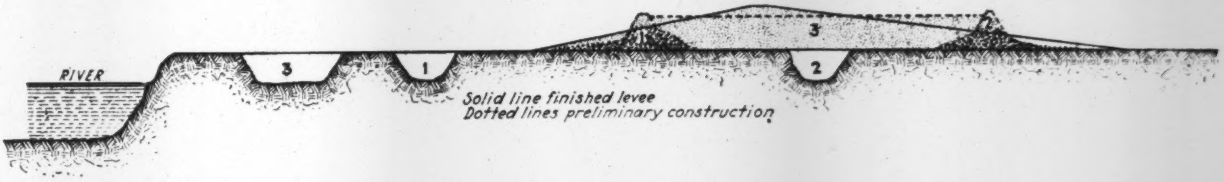

RIVER
3
1
3
2
Solid line finished levee
Dotted lines preliminary construction

FIG. 4—SUGGESTED METHOD OF HYDRAULIC-FILL LEVEE CONSTRUCTION

From Job and Office

Hints That Cut Cost and Time for the Contractor and Engineer

Spacing Stirrups in Concrete Beams Without Aid of Diagrams or Tables

By A. R. Jessup
Bridge Designer, Tennessee Department of Highways, Nashville, Tenn.

THE usual formula for computing the spacing of stirrups, $s = \frac{A_s f_s jd}{V'}$ (where V' represents the shear to be carried by the stirrups at the section under consideration and the other symbols have their usual significance) may be simplified as follows:

$$\text{Let } v' = \frac{V'}{bjd}\ ; \quad \text{then } V' = v'bjd$$

and substituting in the original formula:

$$s = \frac{A_s f_s jd}{v'bjd} = \frac{A_s f_s}{v'b}$$

With a given breadth of beam and size of stirrup, $\frac{A_s f_s}{b}$ becomes a constant and the formula reduces to

$$s = \frac{Constant}{v'}$$

As most designers know by memory the areas of commercial sizes of reinforcing bars, the determination of this constant for a particular beam is a very simple slide-rule computation. As the unit shear at the support of the beam will have been determined already in an earlier stage of the design, it is only necessary to deduct mentally the allowable unit shear for the concrete and divide the remainder into the constant to obtain the first spacing. Then, if suitable values for the other spacings are assumed, the corresponding allowable values of v' can easily be determined, usually with a single setting of the slide-rule. With the usual assumption that the shear has a straight-line variation, the distances from the support to the points where v' has the various computed values can be computed, and the number of spaces required in each group determined.

In order to illustrate the use of the method outlined above, consider the following beam:

Clear span = 20 ft.
Width of stem (b) = 10 in.
Depth to steel (d) = 20 in.
Dead load = 500 lb. per linear foot.
Live load = 1,500 lb. per linear foot.
Shear allowed on concrete = 40 lb. per square inch.
Stress allowed in stirrups (f_s) = 16,000 lb. per sq.in.

$$\text{Max. end shear} = (500 + 1{,}500) \times 10 = 20{,}000 \text{ lb.}$$

$$\text{Unit end shear} = \frac{20{,}000}{10 \times 0.875 \times 20} = 114.4 \text{ lb. per sq.in.}$$

The condition of loading to obtain maximum shear at the center will be obtained with the live load applied to only half the span length.

$$\text{Shear at center of span } 1{,}500 \times 10 \times \tfrac{1}{4} = 3{,}750 \text{ lb.}$$

$$\text{Unit shear at center of span} = \frac{3{,}750}{10 \times 0.875 \times 20} = 21.4 \text{ lb. per sq.in.}$$

Then the decrease in unit shear per foot of span is

$$\frac{114.4 - 21.4}{10} = 9.3 \text{ lb. per sq.in.}$$

and the length of beam requiring web reinforcement is

$$\frac{v'}{9.3} = \frac{114.4 - 40}{9.3} = \frac{74.4}{9.3} = 8 \text{ ft.}$$

If ⅜-in. stirrups are selected, the constant

$$\frac{A_s f_s}{b} = \frac{2 \times 0.11 \times 16{,}000}{10} = 352$$

and the spacing at the support $= \frac{352}{74.4} = 4.7$ in.

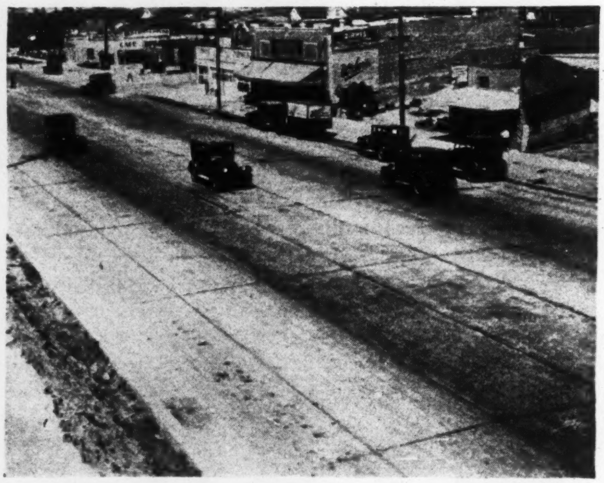
Then selecting spacings of say 4½, 6, 9 and 12 in., the spacing may be changed to 6 in. when $v' = \frac{352}{6} = 58.7$, that is, at $\frac{74.4 - 58.7}{9.3} = 1.7$ ft. from support; 9 in. when $v' = \frac{352}{9} = 39.1$, that is, at $\frac{74.4 - 39.1}{9.3} = 3.8$ ft. from support; 12 in. when $v' = \frac{352}{12} = 29.3$, that is, at $\frac{74.4 - 29.3}{9.3} = 4.8$ ft. from support. The spacing to be used could now be given as five spaces at 4½ in., 4 at 6 in., 2 at 9 in., 3 at 12 in.

The explanation is considerably longer than the actual process, as many of the computations can be made mentally and only the results need be recorded. Many designers assume the shear at the center of the beam to be one-fourth that at the support, and such an assumption will eliminate some computation.

Expansion Joints Mark Traffic Lanes

BY SLIGHT modification of the usual joint spacing in concrete paving, the city of Los Angeles now makes these characteristic markings also serve as lines for traffic lanes. The plan was devised by C. J. Shults, engineer of street design, and has proved very effective. The usual method of directing traffic by means of painted strips on the pavement was expensive, and as the marks became worn by traffic, they were often confused with the longitudinal expansion joints.

The new design consists of spacing the expansion joints and the contraction (dummy) joints so that they

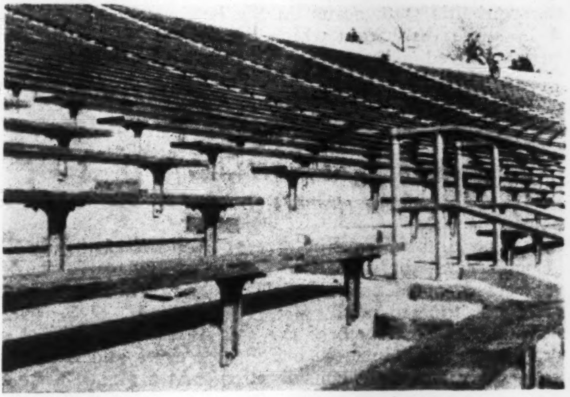


TRAFFIC LANES PROVIDED BY EXPANSION JOINTS, LOS ANGELES, CALIF.

are not only adequate for their original purpose but also divide the paving into traffic lanes of the standard 10-ft. width. Because of the various widths of paving used in municipal work, certain deviations from a uniform spacing are necessary which usually consist of providing an 8-ft. parking space near the curbs with the remaining width divided into 10-ft. lanes.

Simplified Concrete Stadium Details

WELDED pipe railings were used to good advantage in building the concrete stadium of Duke University at Durham, N. C. The location of such railings at the entrances and exits called for a finished-looking job with joints that would not catch the clothing or hands of people coming in contact with them. This effect was obtained by electrically welding standard steel pipe in the manner shown in the accompanying illustration. The cost of these railings did not exceed that of the usual threaded pipe connections made to fit similar angles and locations. This construction also eliminated all pockets and crevices where corrosion might readily start. When finished with aluminum paint the railings harmonized well with the symmetry and outline of the rest of the structure.


RAILINGS AND SEAT BRACKETS AT DUKE STADIUM

Another simplified detail of this stadium, also shown in the illustration, is the type of cast-iron set brackets used. These were likewise coated with aluminum paint to carry out the color scheme. Standard commercial concrete inserts were used to anchor the seat brackets. These were located carefully in the forms for the steps, but slots in them permitted the exact spacing of the anchor bolts of the brackets. The accompanying view indicates the excellent alignment obtained in this manner.

A. C. Lee, chief engineer of the Duke Construction Co., had charge of the building of this stadium as a part of the program of extension of the facilities of Duke University.

Job and Office Notes

Correct Bottom Grade in 68,250 ft. of machine-dug trench for draining the Sky Harbor Airport at Chicago, Ill., was maintained by the use of three targets. Two of these were set along the line of the trench, the third being mounted on the vertical digging boom of the ditcher. By sighting on these three targets the operator was able to keep the trench depth correct at all times. The trenching was done and tile drain installed by William Sundvall, ditching contractor, of Des Plaines, Ill.

Chain Drives of any type will last longer, according to Charles R. Weiss, chief engineer of the Link-Belt Co., if five simple things are done. Check up on all such installations to see that the sprockets are exactly in line, the chains are at proper tension, lubricant is applied frequently, cleaning is done regularly, and the sprockets changed before becoming unduly worn.

All Draftsmen know that a pencil which drops or rolls off the drawing table almost invariably strikes point first, necessitating resharpening. To overcome this tendency, remove the metal tip holding the eraser from a pencil of that type and fill it partly with lead. This tip, when slipped on to the end of a drawing pencil, will cause the heavy end to strike the floor first and obviate much breakage. The same idea can easily be applied to lettering pens, ruling pens and similar instruments which may be damaged by falling.—Morton Schwam, Philadelphia, Pa.

Tractor Hoist Erects Steel

STEEL erection for All Saints Church, Chicago, has been handled by means of a tractor-operated stiff-leg derrick, as shown in Fig. 1. Fig. 2 shows the crawler tractor with its special double-drum hoist attached to the frame. In operation, the tractor is not anchored, but is held in position only by its brakes. It handles loads of about 5 tons. This combined tractor and hoist is owned by a firm engaged in the heavy haulage business and was rented by the contractor for this job. Steel was fabricated and erected by the United Iron & Wire Works. The church was designed by J. G. Steinbach, architect, and is being built by the Mondrala-Wapstas Building Co. as general contractor.

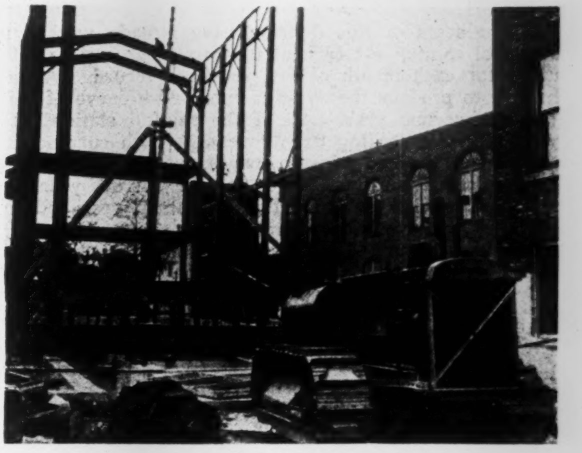


FIG. 1—DERRICK OPERATED BY HOIST ON TRACTOR

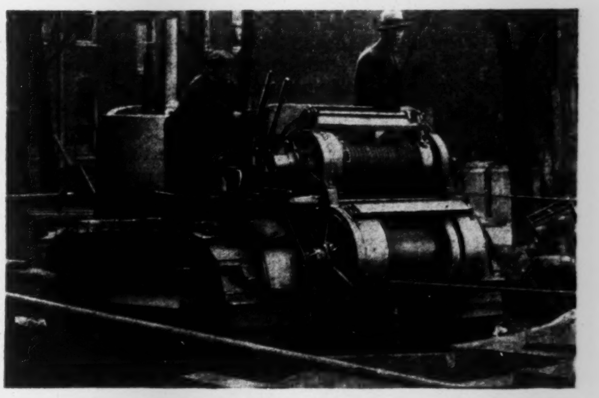


FIG. 2—HOIST ATTACHMENT ON TRACTOR

Letters to the Editor

A Forum for Expression of Views by Engineers and Contractors

Rainfall and Streamflow Records in North Carolina

Sir—I have noted with pleasure the favorable comments in your editorial pages of the Aug. 14 issue relating to the summary reports on rainfall and streamflow conditions in North Carolina, which were begun by the division of water resources and engineering of the state department of conservation and development in June. I think that a few words in explanation of this new effort might be in order.

Particularly I am desirous that your readers should appreciate that a service of this sort involves intensive work on the part of several agencies, which must work with the utmost co-ordination and efficiency. We have arranged with the central office of the U. S. Weather Bureau at Raleigh to furnish us with monthly tables of rainfall at central selected stations on each of the seven major drainage basins of the state. These data are sent to us by the fifth of the month succeeding that in which the data are collected.

The engineers of this division have already worked up the normal rainfall for each of the groups of basic rainfall stations for each month of the period of record. We are then able to produce the average cumulative curve of rainfall in the normal year. All of the rainfall stations used have a record exceeding twenty years. With current data coming in at the end of each month, we are able to produce a cumulative rainfall curve for the current year, and to compare it with the curve for the normal year and also the curve for the minimum previous year of record which has also been computed. With these data at hand, we are able not only to determine the relationship of the rainfall in any current month to that of the normal year and the previous minimum year of record, but to study the conditions of cumulative rainfall. We have found it best to adopt a climatological year beginning in November and ending in October.

With regard to the current reports on streamflow, the situation is considerably more difficult than in the case of rainfall. There are maintained over the state 75 stream-gaging stations, the greatest number in any of the southern states. We have selected seven stations having records in excess of ten years, as base stations to utilize in these studies. Each of these is located about in the center of a major drainage basin. Most of these stations are equipped with recording water stage apparatus. This necessitates that each station must be visited by an engineer from the U. S. Geological Survey office at Asheville or from our office to take off the records for the current month. These records are then sent to the office of the U. S. Geological Survey at Asheville, where daily discharge is computed for each day of the month and sent back to our office for further study. Our current studies from this point on with relation to streamflow are similar to those described above for rainfall, and involve computations of curves for the average year and for the minimum year of record.

It is only by most efficient co-ordination of the activities of our office with those of the U. S. Geological Survey and the U. S. Weather Bureau that we are able to issue a final summary of conditions on each of the seven major drainage basins as regards both rainfall and streamflow by the fifteenth of the month succeeding that in which the data were collected.

I note elsewhere in your issue of Aug. 14 some reference to groundwater conditions. Studies which we have made on a considerable number of rivers in this state, having long periods of record, indicate clearly that groundwater conditions had essentially recovered in this area from the 1925 drought. Our rainfall deficiencies are in many parts of the state markedly below those which existed in 1925, when we had the greatest drought of record. Although our current streamflow is rapidly approaching that of the minimum year of record, it has not yet reached it on any stream covered by our gaging stations. The inference, of course, is clear that the abnormally high rainfall in 1928 and 1929 (the latter year being the greatest of record) was successful in replenishing groundwater reserves which had been depleted in 1925.

Another interesting point to which reference has been made in our monthly statement is that in the western part of the state, where rainfall conditions show a marked deficiency, the streamflow is relatively much less deficient than elsewhere. Indeed, on one drainage basin, the Hiwassee, the streamflow is above normal in spite of the fact that we have a cumulative rainfall deficiency for the current year of nearly 19 per cent. The inference here is that on account of this drainage basin lying almost entirely in a national forest, the groundwater reserves are holding up very much better here than in other portions of the state, where the forests have been removed. The maximum conditions of drought in this state occur on the headwaters of the Dan and Yadkin rivers, from which the forests have been very largely removed.

THORNDIKE SAVILLE.
Chief Engineer, Division of
Water Resources and Engineering.

Chapel Hill, N. C.,
Aug. 18, 1930.

Levee Building With Hydraulic Dredges on the Mississippi

Sir—The editorial in *Engineering News-Record* July 24, 1930, p. 122, on the subject of hydraulic dredges for building levees is noted. The article by Mr. Wilbanks I have not yet had time to read.

I would say that I am of the opinion that the subject of hydraulic dredging in levee building deserves and will have intense study and close consideration. At a glance there is much to commend the idea of such use of the hydraulic dredge.

The levee building of the past on the Mississippi River covers a period of more than a century. In all that time the use of dry land methods has been the method. It has become highly developed. And in all the long years experience has crystallized certain ideas and beliefs that are rooted in the minds of the levee builders of the valley. These ideas are by no means prejudices, but have come as the result of bitter experience. No man can overthrow them readily.

The hydraulic dredging method has certain fundamental things behind it that cannot be ignored:

1. It is the instrument which is at the bottom of the work on the navigable channel.
2. It can handle earth more cheaply than any other instrument.
3. If it can take material from the flood channel or the navigable channel and put this material down as the foundation of a levee, the operations of levee building and channel enlargement for flood control or navigation will be working in co-ordination—mutual support.
4. The weakening of the levee by borrowpit excavation is avoided.
5. The method has the tendency to locate levees for the greatest area of land protection.
6. The method works in support of the idea of developing a better system of bank protection, which is vital to the solution of both the flood-control and navigation problems of the Mississippi River.
7. The economy in the handling of material invites the building of more massive levees to overcome defects in the material which is found in many localities on the river.

The possibilities in the hydraulic dredge on the Mississippi as an instrument for the combined purpose of navigable channel enlargement, including levee building for flood control, are recognized. It remains to see just how practical the results obtainable will be.

Those in charge of the work on the Mississippi River are giving this subject close attention and will continue to do so.

LYTLE BROWN,
Major-General,
Chief of Engineers, U. S. Army.

Washington, D. C.,
Aug. 7, 1930.

News of the Week

Drought-Relief Plan Criticised

Considerable criticism of the federal drought-relief plan is expressed in many states because of the restrictions under which the money is to be spent. The situation in Pennsylvania is perhaps typical of that in many other states. Not more than $200,000 of the $5,300,000 of federal funds allocated to that state under the drought-relief plan is likely to be available, because "too many strings and too much red tape are tied to the federal relief offer," according to the chief engineer of the highway department, Samuel Eckels.

Before Pennsylvania can obtain any of the federal money it must show serious unemployment conditions existing in a particular locality where the road is to be built, or a drought condition so critical that the welfare of the people is endangered, Mr. Eckels said. Such conditions, he pointed out, will be hard to show in localities where improved roads could be laid down with advantage to the state.

Work on New Denver Reservoir to Start Soon

Work on the reservoir to be constructed by the water board of Denver, Colo., in Eleven Mile Canyon is expected to start about Sept. 1, according to C. C. Shrepferman, general manager. The reservoir will be 112 ft. deep and 400 ft. across at the spillway. It will be erected at an estimated cost of $1,500,000 and is expected to be ready for service in June, 1932. The site of the reservoir is in the vicinity of Lake George, and it will be located on the old roadbed of the abandoned Colorado Midland R.R. A new road will be built to take care of the section cut off by building the reservoir.

West Kootenay Company to Develop Pend Oreille River

Licenses giving entire rights for development of the Pend Oreille River to the West Kootenay Power & Light Co., Rossland, B. C., have been issued by J. C. Macdonald, British Columbia provincial water comptroller. The licenses cover a development consisting of two dams, one at Seven Mile Creek and the other at Cedar Creek. These structures together would harness the flow of the river from the Columbia River to the United States boundary and would develop 175,000 continuous horsepower. The company may, however, decide upon construction of one large dam. Now that the water rights have been definitely allotted, no difficulty is expected if plans are changed.

Streamflows in West Reach Record Lows on Smaller Rivers

Water Shortage Is Seen for Hydro Power, Municipal Supply and Sewage Disposal

DROUGHT conditions have improved but little during the past two weeks as regards agriculture and have become generally worse in the growing effect on streamflow. In the wide areas east of the Rocky Mountains which have been in the grip of the drought all summer, little relief has come except for two recent rains from Oklahoma northward to South Dakota. The general drop in temperature which has covered most of the country, plus some regional cloudiness, is slowing down evaporation and checking crop damage to some extent, but it will take soaking rains to bring things back. Old records show that grass has been restored to "normal June conditions" by rains as late as September, but as this is written the day's weather map is almost totally dry, with no storm paths approaching from the west.

Meanwhile streamflow is still dropping and more reports are coming in that record lows for all time have been reached, especially on the smaller streams. Since lows do not normally occur till late in September or in November, even the doubtful prospect of normal rainfall for the next two months cannot prevent serious shortages in water for hydro power, municipal supply and sewage disposal, with the attendant risk of contamination from the depleted rivers now or when rain washes detritus from the dry surface.

Reports on Streamflow

Up-to-the-minute reports on streamflow are hard to supply on a national scale because federal agencies are not often faced with the necessity of supplying such figures except on a monthly or an annual basis. Some additional regional reports have been received by M. W. Hayes, in charge of the river and flood division of the U. S. Weather Bureau, within the last few days. These, with other information, give the following in addition to the summary published in *Engineering News-Record* of Aug. 14:

Mississippi River—Reports all along stream show in the main that record lows have been reached for this time of the year. This is a spectacular example, but lower stages often occur in the upper part of the river in the winter, when interference with navigation is more from ice than from low stages. Probably the shortage of water on the Mississippi will not be acute, though it will be an inconvenience.

Missouri River—Lower than ever in

Keystone Photo

NEW HUDSON RIVER BRIDGE AT POUGHKEEPSIE

A view of the new mid-Hudson bridge connecting Poughkeepsie and Highland, N. Y., which was opened Aug. 25. The center span is 1,495 ft. long, and there are two side spans, 750 and 755 ft. long respectively, all carried by two 16¾-in. diameter cables. The bridge has a clearance of 135 ft. for a width of 750 ft. in the center of the main span. Its cost was approximately $5,890,000. The bridge was designed by Modjeski & Moran, consulting engineers, New York City, and was built under the direction of Frederick Stuart Greene, superintendent of the state department of public works. Tolls will be charged until the cost of the bridge is amortized.

August. Tribuaries are not at unusual low in North Dakota and Montana, but in Iowa and Nebraska are very low, with smaller ones dry. Streams are very low and some are dry in Kansas. Some Iowa towns are in a serious plight as to sewage disposal and water-supply pollution, with streams at virtually zero flow.

Miami River—Very low, and other interior Ohio streams likewise.

Michigan—River stages at record low.

Wabash River (Indiana) — At lowest since record in 1895.

Wisconsin River—Power plants practically idle.

Yazoo River (Mississippi) — Rains in May brought up stages, which have held fairly well since.

Rio Grande—Low, but not at record; similarly through Texas.

Tennessee River—Not so low as in 1925, the record year, but one large upper tributary reported at record.

Cumberland River—Not so low as in 1925 and 1913.

Alabama, Georgia and North Carolina—Rivers not so low as in 1925.

Virginia — Rappahannock, James and Appamattox Rivers in east provide practically no power generation. Village of Falls Church faces serious water-supply shortage. Many residents are driving into Washington for water.

Delaware River—Not at record low.

Connecticut River—Not at record low.

Niagara River Bridges Approved

The War Department has approved the plans of the Niagara Frontier Bridge Commission for a bridge across the east branch of the Niagara River from Grand Island to Tonawanda, N. Y. The department has also approved plans of the commission for a bridge across the east branch of the Niagara River between Niagara Falls, Buckhorn and Grand Island, N. Y.

Two New Bridges Planned on Route to Holland Tunnel

Bids on the construction of two bridges, over the Hackensack and Passaic rivers, for a new route to the Holland vehicular tunnel between New Jersey and New York City will be accepted by the New Jersey state highway commission on Sept. 15. The bridges, which will cost more than $1,000,000, will be identical in size. They are to have center spans of 550 ft. with two end spans of 350 ft., and there will be clearance of 135 ft. over the rivers. The cantilever structures are part of route 25, described in *Engineering News-Record,* June 12, 1930, p. 973.

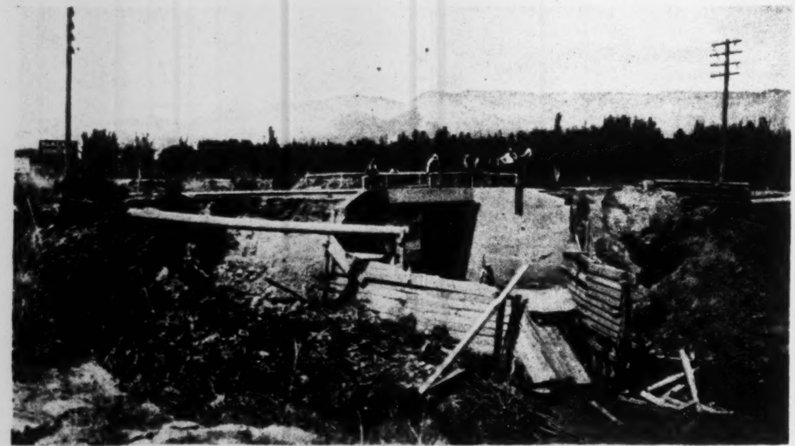
Census Bureau Ignores Population Claims of "Greater Atlanta"

Reversing a previous announcement, the United States Census Bureau has decided that it will list the population of Atlanta, Ga., as 270,035, ignoring the claim of the city officials, who insist that the population should be listed as 359,668, which would include the people in the area of the so-called "Greater Atlanta."

In 1929, as told in *Engineering News-Record,* Aug. 29, 1929, p. 348, by legislative enactment there was annexed to Atlanta all of Fulton County except two election districts on the north end, and, in addition, that part of the city in DeKalb County was extended. The area of the city was increased from 36 to 179 square miles. Cities taken into Greater Atlanta were Avondale, College Park, Decatur, East Point and Hapeville. Also included were the unincorporated communities Nos. 1 to 15. Each city was to be called a borough.

The act, which took effect Jan. 1, 1930, provided that the greater city council should be composed of mayors of the cities and other representatives of the boroughs, and provided also for representation on the council of the unincorporated communities. The council has advisory powers only, but is to study a plan for the future government of Greater Atlanta. For funds it is dependent on popular subscriptions.

The decision of the Census Bureau is not pleasing to the citizens of Atlanta, and a committee is preparing to make a formal protest.



EFFECT OF CLOUDBURST ON WESTERN COLORADO HIGHWAY

The illustration shows how the approaches were washed out behind a concrete bridge on the main highway just east of Grand Junction, Colo., by a cloudburst falling on Bookcliff Mountains, shown in the distance. Normally the stream is almost dry, but shortly after the storm water had overflowed the banks and spread out over the surrounding country. Piling and horizontal sheeting had been previously placed to prevent washing of the toe of the approach fills. The only damage to the bridge was the washing out of the concrete apron on the downstream side, which, as can be seen in the illustration, is being temporarily repaired with planking.

Anchorage Basin Planned for New York Harbor

Preliminary surveys for the construction of an anchorage basin off the south shore of Staten Island which will permit the abolition of all other anchorage areas in New York harbor will be started in September by engineers of the Port of New York Authority.

The plans call for the erection of a concrete breakwater more than 6 miles long, beginning at Fort Wadsworth and describing a semicircle to Old Orchard Light. It will encompass an area of 9½ square miles and provide a depth of 40 ft. The basin will be large enough to accommodate all the big craft seeking anchorage in the harbor, the purpose being to restrict liners which now occupy space in the Narrows and which frequently clutter the channel. There will be three entrances in the proposed breakwater, each 2,000 ft. wide and 40 ft. deep.

Port Authority engineers estimate that the surveys for the breakwater will take more than a year to complete.

Ontario to Have Outlet to Tidewater

The contract for the last section of the extension of the Temiskaming & Northern Ontario Ry. to James Bay has been let to the H. F. McLean Co., Ltd., of Toronto, the same firm now engaged in the other portion of the work. The company will build a temporary bridge over Moose River, to permit laying steel to the terminal, which will afterward be replaced by a permanent 1,500-ft. bridge. On completion of the work Ontario will have an outlet on tidewater.

Contract Let for Abitibi Power Development

The $23,000,000 contract for the construction of the dam and power house in connection with the Abitibi power development has been awarded to the Dominion Construction Co. Work on the project will begin in the near future, and will take from sixteen months to two years to complete.

Seven Large Hydro Projects Proposed in Oregon

In seven separate applications filed with the Oregon state engineer the California Oregon Power Co. has asked for authority to appropriate a total of 3,385 sec.-ft. of water from the North Umpqua River for the purpose of developing approximately 188,661 hp. The estimated cost of the seven projects will be $29,650,000. According to information in the office of the state engineer, the utility has already received a preliminary permit from the Federal Power Commission for right-of-way over government lands.

Partial descriptions of the contemplated projects, as given in the applications, are as follows:

Rock Creek Project—Appropriation of 800 sec.-ft.; concrete arch dam 215 ft. high and 1,350 ft. long; tunnel 4,800 ft.; fall 221.5 ft.; horsepower 20,136; estimated cost $8,700,000.

Clearwater Project No. 1—Appropriation of 150 sec.-ft.; concrete slab and rock dam 20 ft. high and 350 ft. long; canal and pipe line 34,000 ft.; fall 555 ft.; horsepower 10,091; estimated cost $1,500,000.

Clearwater Project No. 2—Appropriation of 235 sec.-ft.; pipe lines and canals 33,500 ft.; concrete arch dam 53 ft. high and 230 ft. long; fall 875 ft.; horsepower 23,366; estimated cost $2,100,000.

Lemolo Project No. 1—Appropriation of 400 sec.-ft.; rockfill and concrete slab dam 60 ft. high and 430 ft. long; pipe lines and canals 38,600 ft.; fall 775 ft.; horsepower 35,227; estimated cost $3,500,000.

Lemolo Project No. 2—Appropriation of 400 sec.-ft.; simple masonry dam; tunnels and pipe lines and canals 19,200 ft.; fall 750 ft.; horsepower 34,091; estimated cost $2,100,000.

Tonketee Project—Appropriation of 600 sec.-ft.; concrete spillway dam with rockfill ends; tunnel 27,600 ft.; fall 715 ft.; horsepower 48,750; estimated cost $6,500,000.

Boundary Project—Appropriation of 800 sec.-ft.; concrete arch dam 220 ft. high and 480 ft. long; tunnel and penstock 2,600 ft.; fall 137 ft.; horsepower 17,000; estimated cost $5,350,000.

Another International Bridge Over the Rio Grande

Construction will soon be started on a toll bridge across the Rio Grande at a point just south of San Benito, Tex., the building of which has been approved by the Department of Communications and Public Works of Mexico and by the Congress of the United States. The bridge will be of the suspension type and will cost approximately $300,000. Its owners intend to build a casino and lay out a town on the Mexican side of the bridge. There are at this time six international toll bridges on the Rio Grande within a distance of 150 miles of its mouth.

Texas Highway Commissioner Nominated for Governor

Ross S. Sterling, of Houston, chairman of the Texas state highway commission, received the Democratic nomination for governor at the second primary election Aug. 23. The Democratic nomination is equivalent to election in Texas. Sterling advocates a $300,000,000 highway bond issue for the state.

F. R. Fisher, Chief Engineer Philadelphia City Transit, Dead

Frank R. Fisher, chief engineer of the Philadelphia department of city transit, died suddenly on Aug. 15 in his 59th year at his brother's home in Lansdowne, Pa. His death is believed to have been the result of an attack of heart disease and he passed away while sleeping. Mr. Fisher was graduated in civil engineering from Lehigh University in 1891 and shortly afterward entered the service of the city of Philadelphia in the bureau of surveys. He was later transferred to the bureau of filtration and took a prominent part in the design and construction of the city's filter system, on which construction began in 1901.

From 1903 to 1909 Mr. Fisher was resident engineer for the Philadelphia Rapid Transit Co. in charge of the construction of the Market St. subway and elevated railway, which was the first high-speed transportation line built and placed in operation in Philadelphia. From 1909 to 1916 he was engaged in private practice. In 1916 he was appointed engineer in charge of subway construction for the city and supervised the construction of the first units of the new city-owned high-speed rapid-transit system. In 1924, when H. H. Quimby retired, he became chief engineer of the department and held this position until the time of his death.

FRANK R. FISHER

During the period when Mr. Fisher was chief engineer of the department of city transit the Broad St. subway, a structure approximately 7 miles in length and of four-track capacity, was constructed, completely equipped and placed in operation at an approximate total expenditure of $100,000,000.

Mr. Fisher's greatest strength lay in his ability to direct and conduct construction work efficiently. He had a genius for handling field operations so as to assure harmonious relations with the contractors and early and satisfactory completion of the structure to be built. He was held in high esteem by his colleagues and associates, and his death is widely regretted.

City to Try to Hold Contractors for Detroit Sewer Failure

The city council of Detroit has unanimously adopted a resolution holding the contractors responsible for the collapse of the Southfield sewer. The action of the council was based on a formal opinion by Clarence E. Wilcox, corporation counsel, taking issue with the report of the engineering experts employed by the city, which held that the city and the contractors were jointly responsible. This report was summarized in *Engineering News-Record*, Aug. 7, 1930, p. 210.

The corporation counsel held that sufficient evidence exists to place the legal blame for the failure on the contractors. A review of the testimony and of the report of the engineering committee indicated, he said, that the two sewer sections that failed were not built in accordance with the specifications.

"The committee contends," the opinion said, "that the city should share in the responsibility for the failure of the sewer due to lack of proper inspection. We cannot agree with this contention. . . . If employees of the city overlook any failure on the part of the contractor to comply with the specifications, the city still has legal redress. . . . Under the law, a contractor must comply with the plans and specifications, even though his work is not inspected as it progresses."

The contractors, by the resolution of the city council, were notified to complete their contracts and warned that otherwise the city would do the work and charge it back to them. The resolution gives the contractors ten days in which to state their position.

Steel Contracts Awarded for Two Canadian Bridges

The city of Quebec has awarded a contract to the T. E. Rousseau Co. and the Eastern Canada Steel Works for the steelwork on the new bridge over St. Charles River, for which an expenditure of $400,000 has been authorized.

The Pacific Great Eastern Railways has awarded the contract to the Dominion Bridge Co., of Montreal, for the fabricated steel for the superstructure of the bridge over Fraser River, British Columbia, at $200,000.

San Francisco Bay Toll Bridge Operated at a Loss

Operation of the San Francisco Bay toll bridge for its first year resulted in a deficit of $232,699.09, of which $135,700.99 is a depreciation charge based on the life of the franchise, and $40,258 represents amortization and bond discount and expense. Operating costs and interest on bonds and debentures exceeded the actual income by $56,739. However, commercial traffic is showing a steady increase and a growth in passenger traffic is expected.

St. Francis Dam Disaster Chapter Closed

Contracts for closing the final chapter of the St. Francis dam disaster of 1928 were signed on Aug. 13 by representatives of the city of Los Angeles, owner of the broken dam, and agents of the Santa Clara River valley. They call for construction of 32 miles of jetties and embankments costing $312,500, to confine the ripped-out river to its original bed. Issuance of $556,000 in bonds to pay damage claims has been authorized by the Los Angeles city council.

Engineers Studying Plans to Bridge Chesapeake Bay

Engineers are preparing data on the subject of bridging Chesapeake Bay, which the Bay Bridge Commission, appointed some time ago by Governor Ritchie, will include a report to the Maryland general assembly next January. The last session of the general assembly authorized the Chesapeake Bay Bridge Co. to construct the span, the estimated cost of which is between $10,000,000 and $12,000,000. Following this action the governor appointed the commission, which is headed by B. Howell Griswold, Jr., to make a study of the entire project.

Garages Under Public Parks Advocated in San Francisco

The construction and operation of subterranean garages under public parks in San Francisco is advocated by the Chamber of Commerce of that city, whose board of directors has indorsed a proposed charter amendment to make this possible. The amendment would give the park commission authority to grant 50-year leases to private individuals or corporations for the operation of such garages. It would provide that the construction or operation must not be detrimental to the original or present purpose of the park, and that all revenues from the leases should go into the park funds. The park commission would also have the right to prescribe the terms and conditions of the sub-surface construction.

Passenger Landing Stage for Port of London Completed

The project planned some years ago for the modernization of the London docks has been carried a stage further by the opening recently by Prime Minister MacDonald of a new passenger landing stage at Tilbury Docks. The total expenditure in dock improvements since 1909, when the Port of London Authority was constituted, is $80,000 000.

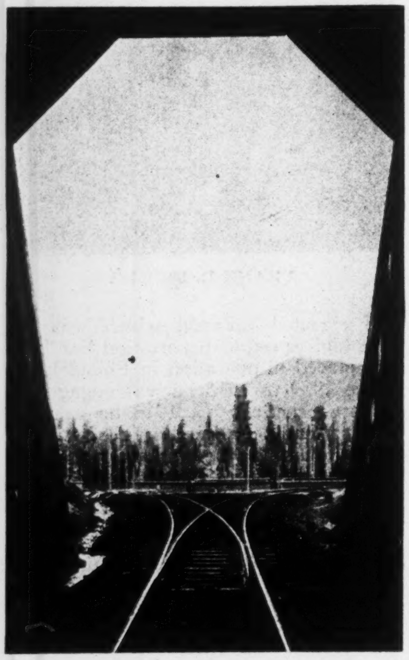
Passenger transport through the port of London has increased rapidly of late years, reaching a total of 306,000 in 1929, but hitherto no centralized facilities have existed for the convenience of passengers. The opening of the new landing stage removes, therefore, a longstanding disability and will enable the discontinuance of the practice of conveying passengers by tender between the shore and vessels lying in the river.

The landing stage was built at a cost of $3,500,000, and is so constructed as to allow any vessel using the port to lie alongside at any state of the tides. It consists of a platform 1,142 ft. long and 80 ft. wide, constructed of heavy steel girders with hardwood decking, built on 63 pontoons. On the stage a two-story building 500 ft. long has been erected to provide waiting rooms, shelters and other accommodations.

National Engineering Inspection Association Organized

Announcement has recently been made of the organization of the National Engineering Inspection Association, the objects of which are "to promote a proper understanding and co-operation among those engaged in, and connected with, engineering inspection; to establish practices which will prove beneficial to proper service; and to develop and encourage better and more effective inspection methods." Its members will include individuals, partnerships or corporations regularly engaged in the general practice of engineering inspection.

The officers of the association are: president, Watson Vredenburgh, president, Hildreth & Co., Inc., New York City; vice-president, J. D. Stoddard, vice-president, Detroit Testing Laboratory, Detroit, Mich.; secretary-treasurer, B. H. Witherspoon, president, Pittsburgh Testing Laboratory, Pittsburgh, Pa.



A TUNNEL WITH ONLY ONE PORTAL

Extending the tail track of a wye 165 ft. in a mountain side was the construction innovation recently resorted to by the Southern Pacific in southern Oregon under pressure of limited space. Severe winter weather conditions made the use of a turntable impracticable because it would have necessitated complete housing. The unique solution of this problem is credited to George W. Boschke, chief engineer.

Municipal Improvements Society to Meet in October

The program for the annual meeting of the American Society for Municipal Improvements, Oct. 13 to 17 at Richmond, Va., has been arranged and contains three dozen papers and eight technical reports. Subjects to be covered include: traffic control and transit facility, street lighting, street design, airport control and traffic paving materials, filtration and softening of water, city planning and its relation to traffic, zoning and its effect on building operations, municipal legislation and financing methods, sewage-treatment requirements and chemistry, garbage disposal, collection and street cleaning, utility rates and problems of the municipality. C. W. S. Sammelman, St. Louis, is secretary.

Brief News

A Water-Works System was put into operation recently at Villa Acuna, a Mexican city across the border from Del Rio, Tex. Previously this city was supplied with water by carriers.

Electrification of part of its tracks in Chicago is in contemplation by the Illinois Central R.R. The railroad has made its surveys, compiled its data and estimated the costs and expected earnings.

Feasibility and Cost of a sewage-disposal plant at South Bend, Ind., will be determined by the Burns & McDonnell Co., Kansas City, Mo., which firm has been awarded the engineering contract for a survey by the board of public works.

Construction of a 319-acre industrial terminal fronting on the Richmond inner harbor of San Francisco Bay has been announced by the Atchison, Topeka & Santa Fe Ry. The project calls for filling 162 acres of submerged land, to cost $250,000.

The Contract to build a rapid sand filter system for the new water supply of Athens, Greece, at a cost of about $400,000, has been awarded to Ulen & Co., of New York City. American equipment will be used. This will give

Athens a modern water system, with a daily supply of more than 15,000,000 gal.

A Bond Issue of between $250,000 and $300,000 has been voted by the board of commissioners of Paris, Ky., the proceeds to be used for the erection of a municipal water-works. The commissioners intend to build a new plant, but it is possible that the plant of the Paris Water Co. may be purchased.

Earthquakes and Earthquake Resistance will be discussed in a series of lectures to be given during the spring of 1931 by Prof. K. Suyehiro, well-known Japanese authority, under the auspices of the American Society of Civil Engineers. The talks will be delivered at a number of American universities yet to be selected.

Application of San Francisco board of harbor commissioners for an extension of the pierhead line approximately 400 ft. between the foot of Van Ness Ave. to pier 26, Townsend St., has been granted by the War Department. This will permit construction of piers 1,200 ft. in length.

Gas Utilities of California laid more than 600 miles of natural gas transmission lines during 1929-30 at a total cost of approximately $30,000,000. The transmission lines have a total carrying capacity of approximately 400,000,000 cu.ft. of gas per day. The total production of natural gas in California during that year was 599,432,424,000 cu.ft.

Cargo aggregating 279,938,333 long tons passed through the Panama Canal in the sixteen years of operation which ended on Aug. 14. During the sixteen years, 60,133 commercial vessels passed through the canal, on which tolls amounting to $250,660,068 were levied. The past decade accounted for 82 per cent of the transits and 86 per cent of the tolls and cargo.

Aerial Photographs of the southern section of the Atchafalaya River basin will be made on specifications that have been prepared and which will be sent to prospective bidders upon request. The area to be photographed covers approximately 1,780 square miles. Bids will be opened on Sept. 2. Further information will be given by W. H. Holcombe, major, Corps of Engineers, New Orleans, La.

A Contract for the new fireproof viaduct between Dallas, Tex., and Oak Cliff, to carry street car traffic, has been awarded by the Northern Texas Traction Co. and the Dallas Railway & Terminal Co. to the Austin Bridge Co., whose bid was $506,780. The bridge itself will cost $407,000, and an additional $99,280 is allowed for laying tracks, for overhead structures to carry trolley wires, and for costs of engineering and supervision.

Open Competitive Examinations are announced by the U. S. Civil Service Commission for principal civil engineer, $5,600 to $6,400 a year; senior civil engineer, $4,600 to $5,200; and civil engineer, $3,800 to $4,400. Applications must be on file with the commission at Washington, D. C., not later than Sept. 10. Competitors will not be required to report for examination but will be rated on their education, experience and fitness.

WASHINGTON NOTES

By Paul Wooton

Washington Correspondent

Plan to Push Flood-Control Work to Aid Farmers—Memphis Asks for Better Mississippi River Navigation

Conferences over the weekend between the President, Major-Gen. Lytle Brown and Col. George R. Spalding resulted in a plan under which river and harbor and flood-control work will be pushed as rapidly as is consistent with the economical use of the money. Consideration is being given a plan to encourage the use of local materials in both river and highway work. It is believed that arrangements can be made for financing the accumulation of stocks of materials, such as gravel and stone, available on nearly every farm, even if they are not needed in the near future. In this way it is hoped that employment can be furnished at or near home for many farmers. Many farmers, too, have on their lands materials suitable for the making of mattresses to be used in revetment work. It is recognized that willow suitable for that purpose is not widely distributed, but nearly any kind of green lumber, regardless of grade, can be used to make mattresses.

Bureau of Roads officials expect the state highway departments to undertake considerable amounts of force-account work. In that way construction work can begin without prior preparation of complete plans. Large numbers of teams can be used to advantage as traction for scrapers, graders and drags.

There is no way, without legislation, under which federal-aid road funds can be used off the 7 per cent system. But the effort of the states to match the maximum possible amount of federal-aid allocations will in no sense divert money from minor roads, as the existing state law provides for specific sources of revenue for construction on such roads.

The Business Outlook

The first two weeks of August probably marked the beginnings of a real process of recovery, somewhat slower and more painful because of unfavorable agricultural conditions. Industrial activity continues static. The rate of expansion of bank credit tends to lag somewhat in comparison with the usual seasonal increase. The definitely encouraging feature of the past week is the improved tone of commodity markets and the increased evidence that the decline in commodity prices has been checked.

—The Business Week, Aug. 27.

May Advance Appropriation

Hope is pinned upon the financing of road work by contractors until the 1931 appropriation becomes available next July. Since contractors would have to pay the interest on funds thus used, few of them would be in a position to absorb any such additional cost. It has been suggested, however, that a gentleman's agreement might be worked out with the appropriations committees of Congress providing for the appropriation of the 1931 money immediately after Congress assembles in December. In that way planning could go ahead with the knowledge that the 1931 money would be available in January, rather than in July. Winter does not greatly interfere with highway work south of the Potomac and Ohio rivers and certain kinds of work can be carried forward throughout the winter in the northern states. Any increase in road work, it is contended at the Bureau of Roads, is certain to result in increased employment, as 75 per cent of the cost of highways is represented by payments to labor, both on the roads and in the preparation of materials.

Stream-Gaging Service Extended

Extending federal stream-gaging services into new territory, the water resources branch of the U. S. Geological Survey has opened three additional offices—in Florida, Michigan and Indiana. This will make a total of 32 offices, including one in Hawaii. Another district is proposed in a section of the southeastern states. Last year $1,200,000 was spent in stream gaging under the Survey, including co-operative funds advanced by the states, by local parties, and by the Corps of Engineers. Larger appropriations will be available this year.

The new office serving Indiana and part of Kentucky will be at Indianapolis under the direction of H. E. Grosbach, formerly district engineer in Chicago. The Indiana department of conservation is the co-operating party. J. H. Morgan will take the Chicago office. Berkely Johnson will head the new office in Lansing, Mich., in co-operation with the state conservation and highway departments. In Florida the state highway commission is co-operating in the maintenance of an office at Ocala under D. S. Wallace.

Seek to Improve Navigation on Lower Mississippi

President Hoover and Major-Gen. Lytle Brown, Chief of Engineers, were appealed to last week by a delegation from Memphis, headed by Mayor Overton, to do something to improve navigation on the lower Mississippi. Because of unusually low water in the river between Memphis and St. Louis the traffic of the federal barge line has been subject to serious delays. It is believed that some of the obstructions to navigation caused by bars and channel restrictions can be eliminated by bank revetment. Friends of the barge line feel that its future has been seriously injured by the uncertainty created among shippers by the irregular service during July and August. Failure to maintain a proper channel in the Mississippi River has resulted in delays, and much freight that has been offered could not be accepted. During July it was necessary to refuse more than 3,000,000 bushels of grain alone.

Some advocates of inland waterway development question the advisability of improving the upper Mississippi and its tributaries while there are still some bad places on the main trunk of the river. It is thought that the engineers should devise some method other than dredging for maintaining the channel in the lower river. It is true that wing dams have been used in some places, but frequently they have tended to retard rather than expedite navigation.

President Approves Rio Grande Plans

The report of the International Boundary Commission, outlining general plans for bank revetment works along the Rio Grande, was approved by President Hoover last week. This does not finally allow the work to commence, but it paves the way toward a treaty between the United States and Mexico for the joint conduct of preventive measures against floods and bank erosion.

Personal Notes

R. H. Thomson, who served as city engineer of Seattle, Wash., under a number of administrations previous to 1912, has been named to succeed William D. Barkhuff, who was killed in an automobile accident last month. Since leaving the service of the city, Mr. Thomson has been engaged in private practice.

Bert H. Peck, of Madison, Wis., has been appointed to the newly created post of chief engineer of the Public Utilities Commission of Washington, D. C. Mr. Peck was formerly a member of the technical staff of the Illinois Public Utilities Commission, now the Illinois Commerce Commission, and was engaged in much of the Illinois commission's early valuation work. He has recently been in private engineering practice.

Walter W. Gruber, who during the past four years has been assistant engineer in the division of dams of the Water and Power Resources Board of Pennsylvania, has been assigned to represent that board on the construction of the Safe Harbor Water Power Corporation dam across the Susquehanna River at Safe Harbor, Pa. Previously Mr. Gruber was with the United States Engineers on the St. Lawrence waterway investigation and on the construction of navigation locks and dams on the Ohio River.

John M. Young, city engineer, Dallas, Tex., is in an Amarillo hospital recovering from serious injuries sustained Aug. 10 near that city in an auto accident. Both of Mr. Young's legs were broken and his entire scalp was torn loose.

C. C. Shrepferman, an engineering contractor, resigned as president of the water board of Denver, Colo., on Aug. 19 and was immediately appointed general manager of its plant, succeeding Hiram E. Hilts, who resigned on account of ill health.

Clyde W. Drew, who was formerly a member of the engineering firm of Briggs & Drew, Omaha, Neb., which firm was announced in the Aug. 14 issue as being dissolved, will continue as a drainage contractor under the firm name of the Clyde W. Drew Co., with offices in the same building as heretofore.

A. N. Hauser, general superintendent of the De Julio-Izzie Construction Co., has been appointed assistant city engineer of Memphis, Tenn., and will take office on Sept. 1. Mr. Hauser has been in the contracting business for fifteen years, in Memphis for three years. He takes the place formerly held by Dave Renfrow, the latter succeeding the late C. W. Davis as general superintendent of the Memphis park department.

J. C. Lamarche, of Montreal, Que., who has recently been employed as superintendent on the construction of the Quebec Harbour Commissioners' new grain elevator, has been appointed superintendent for the construction of the Canadian Pacific ocean terminal freight shed that the commission is building at Wolfe's Cove, Quebec. Previously, Mr. Lamarche was with the John S. Metcalf Co., grain elevator engineers, on the construction of grain conveyor galleries at St. John, N. B., and Montreal, Que.

Society Calendar

AMERICAN INSTITUTE OF STEEL CONSTRUCTION, New York City; Pinehurst, N. C., Oct. 27-28.

AMERICAN IRON & STEEL INSTITUTE, New York City; semi-annual meeting, New York City, Oct. 24.

AMERICAN SOCIETY OF CIVIL ENGINEERS, New York; fall meeting, St. Louis, Mo., Oct. 1-3.

AMERICAN WELDING SOCIETY, New York; fall meeting, Chicago, Sept. 22-27.

INTERNATIONAL ROAD CONGRESS; Washington, D. C., Oct. 6-11.

NATIONAL SAFETY CONGRESS, Chicago; annual meeting, Pittsburgh, Pa., Sept. 29-Oct. 3.

NEW ENGLAND WATER WORKS ASSOCIATION, Boston, Mass., annual convention, Atlantic City, N. J., Sept. 23-26.

AMERICAN ASSOCIATION OF SANITARY ENGINEERS, meeting in Winnipeg, Manitoba, Canada, Aug. 16, elected the following officers: president, A. R. McGonegal, Washington, D. C.; secretary, T. M. Dugan, McKeesport, Pa.; treasurer, J. F. Doud, Cincinnati.

AMERICAN WATER WORKS ASSOCIATION announces that its board of directors has chosen Pittsburgh as the convention city for 1931, the exact date of the meeting to be announced later. At the convention at St. Louis last June three cities were claimants for the convention—Detroit, Philadelphia and Pittsburgh.

CENTRAL STATES SECTION, American Water Works Association, will hold its annual convention in Youngstown, Ohio, on Sept. 25 and 26. B. J. Lechner, Erie, Pa., is secretary.

INTERNATIONAL ASSOCIATION OF MUNICIPAL ELECTRICIANS at its annual convention in Denver Aug. 16 elected the following officers: president, Charles J. Reading, Salt Lake City; secretary, William H. Harth, Columbia, S. C.; treasurer, Leslie R. Haight, Binghamton, N. Y. The 1931 convention will be held in Jacksonville, Fla., beginning Oct. 1.

NATIONAL RIVERS AND HARBORS CONGRESS will hold its 26th annual convention in Washington, D. C., Dec. 9 and 10.

Obituary

Samuel C. Fox, builder of the first water-works system of Olean, N. Y., died at Eureka Springs, Ark., recently, at the age of 73. In 1905 Mr. Fox had charge of the erection of the first refinery stills of the Texaco Co. at Port Arthur, Tex.

J. L. Ludlow, of Winston-Salem, N. C., died in a hospital in that city on Aug. 18, after a protracted illness. During his life Mr. Ludlow achieved national fame as a consulting civil, sanitary, contracting and hydraulic engineer. During the World War he was connected with the cantonment division of the U. S. Army as supervising engineer in the construction of Camp Green at Charlotte, N. C. Subsequently he served as supervising sanitary engineer of the United States Shipping Board.

Joseph L. Smith, of Seattle, Wash., died on Aug. 16 following a heart attack. He was 46 years old, and from his early youth had been engaged in the contracting business, first with his father, W. H. Smith, and his brother Robert, under the name of the J. L. Smith Construction Co., and later with D. H. Traphagen, who died about a year ago. The Smith company handled many of the larger street and water main contracts and highway building jobs in Seattle and vicinity for the city of Seattle and the state highway department.

Edward P. Morse, chairman of the board of United Dry Docks, Inc., New York City, collapsed on Aug. 26 as he was supervising the construction of his country home on the shores of Digby Gut, Nova Scotia, and died before medical aid could reach him. Mr. Morse, who was 72 years old, was a native of Nova Scotia and went to New York many years ago. He founded the Morse Dry Dock & Repair Co. and became president of United Dry Docks, Inc., when that organization was created in 1929 by a merger of six companies. He retired as president last February.

Construction Equipment and Materials

Build Large Overhung Generator for Ariel Project

What is said to be the largest hydroelectric generator of the overhung type yet to be built is now under construction at the Schenectady (N. Y.) works of the General Electric Co. for installation at the Ariel development of the Inland Power & Light Co. on the Lewis River in Washington. The unit, which will be delivered early in 1931, is technically rated 60 pole, 56,250 kva. (45,000 kw., 0.8 power factor), 120 r.p.m., three phase, 60 cycles and 13,800 volts. Total weight will be approximately 1,000,000 lb., more than half of which will be in the rotor. As transportation for the last 4 miles of the journey must be by truck and trailer, the rotor will be shipped disassembled, and the stator, which weighs 220,000 lb., will be transported in four sections. The unit will be of the semi-outdoor type, the top of the machine serving as a roof, while a concrete structure will surround the power portion. The water turbine, to be supplied by the S. Morgan Smith Co., York, Pa., is guaranteed to supply 61,600 hp. with a 185-ft. operating head and is expected to develop 67,000 hp. with a head of 189 ft. Turbine and generator will be mounted on a single 28-ft. shaft with a thrust bearing supporting a load of 1,100,000 lb.

Improvement of Product Stressed at Rail Steel Bar Meeting

Members of the Rail Steel Bar Association met at Hamilton, Ont., Aug. 7 and 8 in their 39th general session to discuss and act on several important problems of production and marketing policies. The program, in addition to the technical and business sessions, included a general study and inspection of the plant and methods of Burlington Steel Co., Ltd., one of the member mills in Canada. Several papers were presented on internal economics of the rail steel industry dealing with the standardization and improvement of administration and production factors such as purchase and sales contracts, accounting and cost-keeping methods, insurance and compensation plans and safety control. Several standard schedules of size and service extras were considered and some were adopted. The quality marking of reinforcing bars, by which all rail steel reinforcing bars produced by member mills are branded with a uniform association symbol, was a subject for considerable discussion.

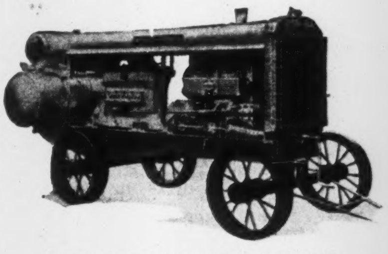
Probably the greatest attention was given at the meeting to a review of methods that have been established to maintain and improve the quality of rail steel bars produced by the associated mills. This work has been conducted by the works managers division of the association. In order to supplement this work and more directly relate production to marketing, there was established at the Hamilton meeting a committee on metallurgy and production, composed of the chief metallurgists of the several mills, which will act under direct supervision of the executive board and in co-operation with the works managers in correlating all production data and investigating the possibilities of both present and future raw materials. It will also act as a consulting board in extending the present program of mill improvement and development.

The Hamilton meeting was an extra session of the Rail Steel Bar Association, which customarily meets semi-annually in New York in connection with the American Iron and Steel Institute.

New Developments

Refinements Made in Motors for Air Compressor Units

Adoption of the H model Continental engine as the power source in 220-, 280-, and 330-cu.ft. Metalweld-Worthington air compressor units has been announced by Metalweld, Inc., Philadelphia, Pa. Notable features of this power plant include removable cylinder sleeves; a primer pump for cold winter starting which replaces the conventional choke; the provision of two air cleaners (one for the engine and one for compressor), gas filter and magnetic gasoline gage as standard equipment, and a dry sump oiling system with which is included a special type of oil filter.

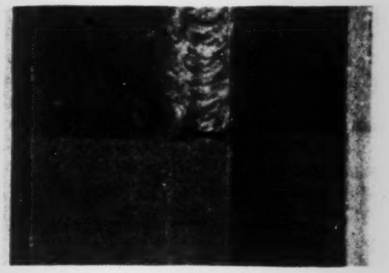


IMPROVED AIR COMPRESSOR

The system of oil circulation in this engine was developed for the purpose of reducing operating temperatures. The old method of crankcase oil pan accumulation has been changed by mounting a special aluminum oil reservoir on the side of the engine block. This reservoir, located directly in the cool air path from the fan, is provided with a series of cooling fins. A separate low-pressure pump takes the oil as rapidly as it collects in the bottom of the pan and forces it to the reservoir and through a metallic disk filter consisting of a series of centerless disks which alternate with a series of copper wiper plates. Foreign matter from the oil lodges between the disks and can be removed daily by turning a handle located on the outside of the reservoir. Cleaned oil overflows from the cleaner compartment into the reservoir proper, whence it flows by gravity to a high-pressure oil pump for recirculation to all bearing surfaces.

Weld Appearance Improved by Special Putty

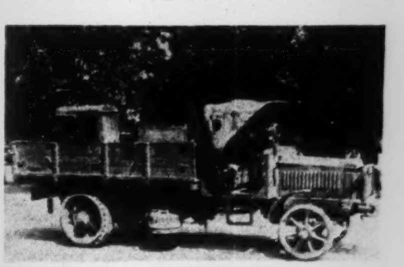
To cover weld beads and give them a smooth finished appearance, the Fusion Welding Corp., Chicago, Ill., has developed Weldite fillet putty, which is easily applied to weld beads in any type of joints or positions. The material is furnished in the form of a powder to be mixed with water. It is applied with a putty knife or brush and, a short time after application, becomes practically as hard as iron, as it is essentially iron. The manufacturer claims that the material will adhere tenaciously and not loosen from shock or vibration.



WELD BEAD TREATED WITH PUTTY

Metal Removed From Road Surface by Truck-Mounted Magnets

Magnetic sweeping of highways to remove the many small pieces of scrap metal which so often cause damage to tires is becoming increasingly prevalent in progressive communities. For this purpose the Electric Controller & Mfg. Co., Cleveland, Ohio, is producing road-sweeping magnets which can be built in practically any size. For highway purposes, the 22-in. diameter magnet is the one most commonly used, three of these units being mounted on a truck



ROAD-SWEEPING MAGNETS MOUNTED ON TRUCK

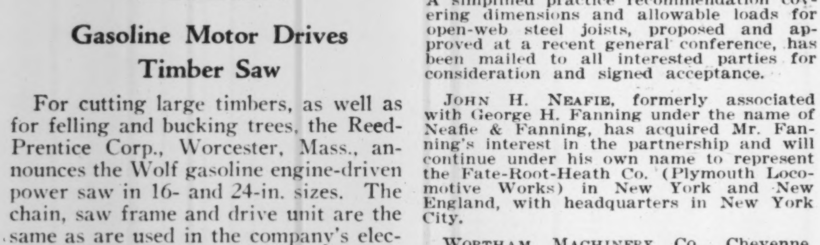
to sweep a path 6 ft. wide. The magnets are usually wound to operate with 110 or 220 volts d.c. which is furnished by a generator set mounted in the truck body. When suspended 5 in. from the ground a magnet of this type will remove nails or tacks completely buried in the surface of a gravel road.

Safety Cable for Lighting

Quick stringing of temporary lights with the safety of a permanent installation is the purpose for which the Sullivan Machinery Co., Chicago, Ill., has developed Stringalite safety lighting cable, manufactured for the Sullivan company by the Rome Wire Co. Stringalite consists of a molded rubber, stranded, No. 10 two-conductor light cable into which molded rubber-covered porcelain lamp sockets are vulcanized at 33⅓-ft. intervals. The cable, being fully insulated, can be hung over any projecting object such as a nail, timber or bracket, no insulators or special supports being needed. Stock lengths of 100 and 200 ft., with end-connectors attached, are available. Other lengths may be had on order, with side extension connectors, if desired. Molded rubber blank screw plugs are used to seal sockets not in use, thus preventing trouble from moisture or short circuits.

Gasoline Motor Drives Timber Saw

For cutting large timbers, as well as for felling and bucking trees, the Reed-Prentice Corp., Worcester, Mass., announces the Wolf gasoline engine-driven power saw in 16- and 24-in. sizes. The chain, saw frame and drive unit are the same as are used in the company's electric and air-driven machines, the construction including a clutch for disconnecting the saw from the motor and a swivel joint, making possible either vertical or horizontal cuts with the engine in an upright position. The motor is of the single-cylinder, two-cycle type equipped with Bosch magneto. The crankshaft is carried on ball bearings, with a roller bearing connecting the bottom of the connecting rod with the crankshaft. Throttle control is from the left handle. Starting is by means of a rope wound around a crankshaft pulley. The two units weigh 82 and 92 lb., respectively.



POWER SAW SET FOR HORIZONTAL CUT

Costs and Contracts

E. N.-R. Index Numbers

Cost			Volume		
Aug. 1,	**1930**	**200.95**	**•July,**	**1930**	**226**
July 1,	1930	200.95	June,	1930	324
Aug. 1,	1929	205.91	July,	1929	320
Average,	1929	207.02	Average,	1929	317
Average,	1928	206.78	Average,	1928	287
1913	......	100.00	1913	....	100

This Week's Contracts

Heavy construction contracts, reported by *Engineering News-Record* in the week of Aug. 28, with some comparisons, total as follows:

(In Thousand of Dollars)

Buildings:	Aug. 28, 1930	Average of Last Four Weeks 1930	Average of Last Four Weeks 1929
Industrial	$4,254	$4,477	$7,316
Other	14,590	24,667	39,242
Streets and roads	12,251	12,254	11,613
Other eng. constr	10,193	18,437	11,677
Total	$41,288	$59,835	$69,848

Total, all classes, Jan. 1 to Aug. 28:
1930 .... $2,353,622
1929 2,895,724

Business Notes

Division of Simplified Practice, U. S. Bureau of Standards, announces that revised simplified practice recommendation 72 —Solid Section Steel Windows—may now be considered as in effect, following the receipt of a sufficient number of signed acceptances to insure the general adoption of the program by the industry as a whole. A simplified practice recommendation covering dimensions and allowable loads for open-web steel joists, proposed and approved at a recent general conference, has been mailed to all interested parties for consideration and signed acceptance.

John H. Neafie, formerly associated with George H. Fanning under the name of Neafie & Fanning, has acquired Mr. Fanning's interest in the partnership and will continue under his own name to represent the Fate-Root-Heath Co. (Plymouth Locomotive Works) in New York and New England, with headquarters in New York City.

Wortham Machinery Co., Cheyenne, Wyo., has been formed to handle construction equipment by John R. Wortham, formerly treasurer and general manager of the H. W. Moore Equipment Company of Wyoming, Inc.

Republic Steel Corp. has placed in operation a new plant for making a new kind of electric welded pipe, following a year's operation of an experimental mill which produced more than 2,000 miles of pipe of the smaller sizes. Sizes to be produced vary from 4½ to 16 in. in diameter.

Curtin-Howe Corp., New York City, has licensed two new plants to use the ZMA process of timber preservation. These are the Maryland Wood Preserving Co., at Hagerstown, Md., and the T. J. Moss Tie Co., at Columbus, Miss. In both cases these organizations are already using the process at other plants.

Independent Pneumatic Tool Co., Chicago, Ill., has appointed C. T. Connelly manager of the Buffalo office.

Flint Structural Steel Co., Flint, Mich., announces that Robert W. Heerlein has resigned as president, treasurer and general manager. Mr. Heerlein has sold his interest in the company to Elmer R. Dail, manager of the Jarvis Engineering Works, Lansing, Mich., who will succeed him as president. Edward H. Perkins will assume the duties of treasurer and general manager.

Genfire Steel Co., Youngstown, Ohio, has appointed Paul R. Clark manager of the New York district office. Mr. Clark was formerly president of the Fireproof Products Co. and before that was sales manager for the General Fireproofing Co.

Lukenweld, Inc., a division of the Lukens Steel Co., Coatesville, Pa., has appointed Everett Chapman director of development and research. Mr. Chapman, who was formerly director of research for the Lincoln Electric Co., will have general direction of laboratory and investigation work in connection with the redesigning of machinery parts for the welded steel type of construction.

Reading Iron Co., a subsidiary of the Philadelphia & Reading Coal & Iron Co., has accepted the resignation of Leon E. Thomas as president. A. J. Maloney, president of the parent company, has been elected chairman of the board of the Reading Iron Co. and will act as president until a successor to Mr. Thomas is appointed.

Link-Belt Co., Chicago, Ill., announces the appointment of William Piez as European correspondent, with headquarters in Paris, France. The Pacific division of the company has just moved into a new manufacturing plant and office at San Francisco, Calif.

Inland Steel Co., Chicago, Ill., has completed a new merchant bar mill at Indiana Harbor, Ind., to produce the smaller sizes of structural shapes.

United Steel Works Corp., Düsseldorf, Germany, was recently awarded a contract for furnishing 16,000 tons of Larssen steel sheet piling for harbor work at Dunkerque, France.

Equipment Corporation of America, Chicago, Ill., has created a new department to serve the crushed stone and gravel industry. This will be in charge of C. B. Watrous, formerly with the Nordberg Mfg. Co. and the Marion Steam Shovel Co.

New Publications

Ash Conveyors—"Modern Methods of Ash Handling" is the title of a new 24-p. catalog illustrating several methods of handling ashes by pipe line, as well as by other types of conveyors, issued by the Brady Conveyors Corp., 20 West Jackson Boulevard, Chicago, Ill.

Water Supply—An article describing the new water-supply system for Fort Lauderdale, Fla., by F. J. Keis, which appeared *Engineering News-Record* for Feb. 20, 1930, has been reprinted by the De Laval Steam Turbine Co., Trenton, N. J., for general distribution.

Pneumatic Equipment—Recent bulletins issued by the Sullivan Machinery Co., Chicago, Ill., include the following: 83-R, portable air compressors; 83-T, direct motor-driven vertical compressors; 83-X, belt-driven single-stage compressors; 83-Z, vertical, high-pressure compressors; 87-C, rotating drills; 87-E, self-rotating water stopers.

Steel Construction—Hay Foundry & Iron Works, Newark, N. J., has issued an elaborate illustrated brochure commemorating the completion of 100 years in business under the management of the same family. This contains illustrations of many modern buildings for which the company has erected the structural steel frames.

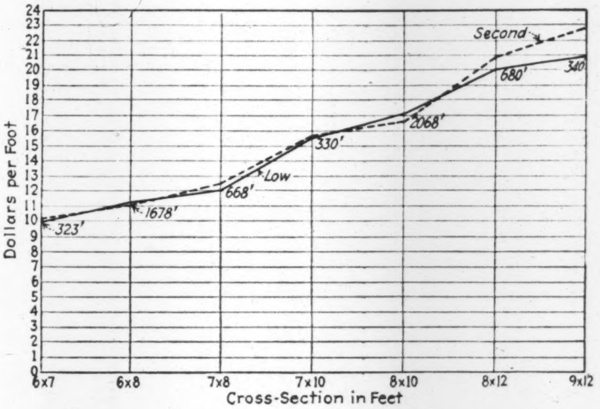
Centrifugal Pumps—The second of a series of centrifugal pump selection chart bulletins has been issued by Goulds Pumps, Inc., Seneca Falls, N. Y. This book, bulletin 201, covers multi-stage pumps for capacities up to 2,000 gal. per minute and heads up to 2,400 ft. Within the limits indicated, it contains charts enabling the prospective pump user to determine just what pump is best suited to his individual requirements, and also complete descriptions and dimensions for pumps manufactured by the company.

Construction Equipment—General catalog 20, issued by the Victor L. Phillips Co., Kansas City, Mo., is an exceptionally elaborate and attractive 608-p. illustrated book describing in detail all items of the large line of construction equipment handled by this distributor. Besides this descriptive material, the back of the catalog contains a number of pages of useful information, including tabular freight rates from the various warehouses of the company to points in its territory.

Unit Prices From Current Construction Bids

Concrete-Box Sewer in Port Arthur, Tex.

CONTRACT was awarded in June, 1930, for 13,822 ft. of concrete storm sewers in Thomas Boulevard, Port Arthur, Tex., as follows: 2,902 ft. of 72-in. pipe; 4,212 ft. of 24- to 36-in.; 6,708 ft. of 6x7-ft. to 9x12-ft. concrete box. W. O. Bower is city engineer. T. L. James & Co., Inc., Ruston, La., was low and received the contract for $170,700.



LOWEST TWO BIDS ON CONCRETE BOX SEWER IN PORT ARTHUR, TEX.

Central Contracting Co., Dallas, was second lowest, at $181,790, of twelve bids averaging $200,000. Unit prices of these two contractors on the principal item, 6,087 ft. of concrete box, are charted herewith.

Bids of these two contractors on other items respectively as follows: 2,902 ft. 72-in. concrete pipe, $13.50 and $14.25 per foot; 3,484 ft. 24-in. pipe, $2.65 and $2.46 for concrete, and $3 and $2.80 for V.C.; 16,478 ft. earth excavation, $0.50 and $0.84.

Superstructure for Highway Bridge at Seattle, Wash.

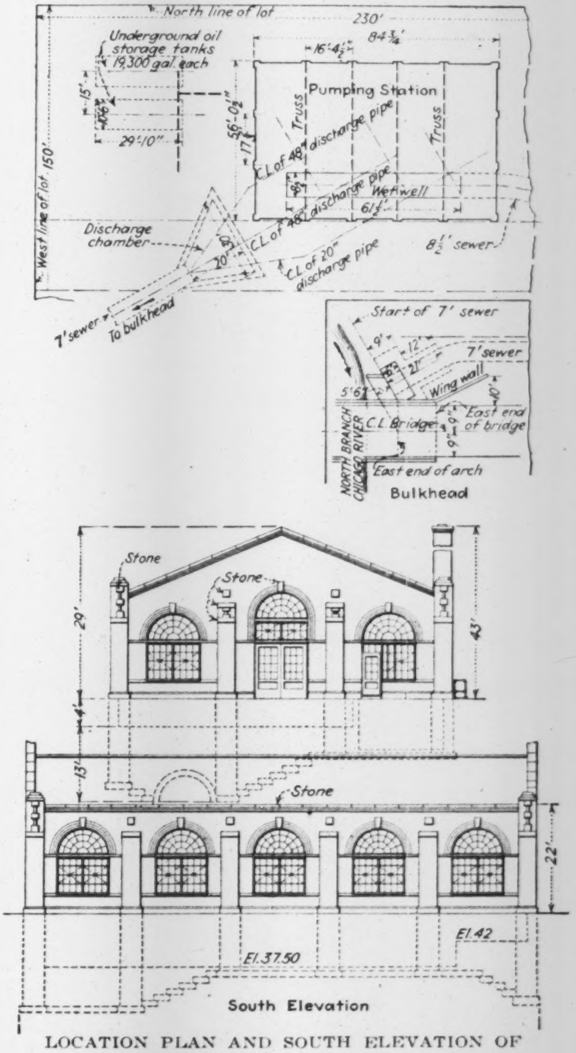
A CONTRACT for supplying materials and erecting the superstructure of the Aurora Ave. bridge in Seattle, Wash., was let in July, 1930, by S. J. Humes, director of highways at Olympia, Wash., to the U. S. Steel Products Co., Seattle, for $1,247,888. The highway bridge has a main span of 800 ft., anchor arms of 300 and 350 ft., two adjacent spans of 200 and 225 ft., and three 75-ft. spans, all of the deck type, with deck 174 ft. above high water. Vertical clearance of the main span is 135 ft. Two other contracts were awarded for (1) approaches and flanking girder spans, $358,808; (2) concrete foundations, $502,274. Complete unit prices are given of the three bidders, second two being: (B) Pacific Bridge Co., Portland, Ore., $1,387,775; (C) Wallace Bridge & Structural Steel Co., Seattle, $1,482,314.

	A	B	C
7,000,000 lb. structural carbon steel in place	$0.061	$0.072	$0.078
8,100,000 lb. structural silicon steel in place	.0705	.081	.089
370 000 lb. steel castings	.12	.12	.104
60,000 lb. steel forgings	.1275	.15	.144
80,000 lb. gray iron castings	.08	.08	.102
2,000 lb. phosphor bronze castings	.75	1.00	.85
1,100,000 lb. reinforcing steel	.055	.04	.0427
3,400 cu.yd. class A conc	21.00	20.00	17.15
200 bbl. extra portland cement at site	2.50	2.00	2.00
200 bbl. high-early-strength cement, at site	4.00	3.00	3.00
4,000 lin.ft. railing, complete in place	10.00	10.00	9.50
4,230 lin.ft. galvanized wire rope, 1-in. diam	.60	.65	.45
Electric wire conduits	4,000.00	4,000.00	3,500.00
1,400 lin.ft. downspouts	5.00	2.50	4.00
2,100 traffic markers	1.50	1.25	1.50
Totals	$1,247,888	$1,387,775	$1,482,314

Sewage Pumping Station at Wilmette, Ill.

SEWERAGE improvements to cost $1,253,338 were placed under contract May 5, 1930, by the board of local improvements of Wilmette, Ill. About 90 per cent of the cost is for stormwater sewers consisting of 100,000 ft. vitrified-tile pipe up to 36 in. and 24,000 ft. vitrified-clay segmental-block sewer of 36 to 102 in. The pumping station fully equipped costs $106,883, according to the estimate of the lowest bidder on the whole project, who was awarded the contract. Unit prices of this contractor are here tabulated for the pumping station, together with the averages of the unit prices of the eight bidders.

The station, as the drawing shows, is 84¾x56 ft. in plan with an average height of about 36 ft. It has a concrete foundation and a brick superstructure with buff Bedford limestone trim, cement floor, steel roof trusses, steel purlins and reinforced-cement roofing tile. The building foundation rests on a concrete footing 12 in. thick by 24 in. wide. The foundation is 6½ ft. high, of which the first 1½ ft. is 16-in. and the remaining 5 ft. is 12-in. The walls are 12-in. brick, faced with pressed gray brick. Inside walls of the main pump room are lined with glazed brick to the level of the


North line of lot
230'
84¾'
Underground oil storage tanks 19,300 gal. each
16'-4½"
15'
29'-10"
56'-0½"
Pumping Station
Truss
Truss
C.L of 48" discharge pipe
Wetwell
C.L of 48" discharge pipe
Discharge chamber
20"
C.L of 20" discharge pipe
8½' sewer
West line of lot 150'
7' sewer
To bulkhead
Start of 7' sewer
7' sewer
Wing wall
5'6"
C.L Bridge
East end of bridge
East end of arch
NORTH BRANCH CHICAGO RIVER
Bulkhead
Stone
Stone
29'
43'
13'
Stone
22'
El. 37.50
El. 42
South Elevation

LOCATION PLAN AND SOUTH ELEVATION OF WILMETTE SEWAGE PUMPING STATION window stools, which are constructed of glazed-brick headers. The rear side of all coping walls from the roof to the stone coping is faced with vitrified paving brick. All other brick is No. 1 common. All brick and stone work is laid in mortar of 1 cement to 2 lime to 5 sand.

Floors of the main pump room and boiler room are of 6-in. concrete placed on a 3-in. layer of cinders. The pitched roof is supported on four fabricated steel trusses with channel purlins for the cement roof tile. Machinery foundations include two of 14x25 ft. by 8 ft. thick for two 48-in. horizontal screw pumps driven by 270-hp. diesel motors; a foundation 4x6 ft. by 2 ft. thick for a 20-in. horizontal screw pump, and foundations for vacuum pump and air compressor. The pumping station also includes a reinforced-concrete wet well 8½x61½ ft. by 9 ft. high. The walls and bottom are 18-in., the top 10-in.

The discharge chamber, located outside the station (see drawing), is a trapezoid in plan, the inside dimensions being 20x7x30 ft., and the depth 15½ ft. The reinforced-concrete walls have a top width of 12 in. and a bottom width of 36 in. and are 17½ ft. high, with the inside face vertical. The floor is 24 in. thick. Three openings are provided for the two 48-in. cast-iron discharge pipes and the 20-in. pipe.

A reinforced-concrete bulkhead supports the outfall of a 7-ft. sewer (see inset in drawing). Foundation is 9 ft. long along the center of the sewer by 24 ft. wide and 4 ft. high. The main portion of the bulkhead, resting on this foundation, is 7 ft. long by 18 ft. wide by 9 ft. high, with the top 5x13 ft.

Two subsurface oil storage tanks of 19,300 gal. each are located 25 ft. west of the north line of the pumping station. The tanks, of $\frac{5}{16}$-in. steel, are 10½ ft. in diameter and 29⅝ ft. long. Units comprising the equipment of the station are listed in the tabulation of unit prices.

Bidding—Eight bids were received on the items forming the pumping station and equipment. Contract was awarded to Cannell Conrad Construction Co., 2300 Oakton Ave., Evanston, Ill. Its complete list of unit prices for the station with averages of the eight bidders are given in the tabulation. A summary follows:

	Low	Average Eight Bids	Per Cent of Total
Building	$34,904	$41,184	32.5
Discharge chamber	4,680	5,323	4.2
Bulkhead	2,340	3,410	2.7
Storage tanks	3,900	4,254	3.4
Machinery	44,694	53,480	42.2
Pipe and valves	16,365	19,057	15.0
	$106,883	$126,708	100.0

	Lowest	Average of Eight Bids
24,000 gray pressed face brick in place	$1,648.80	$1,932
15,000 glazed brick in place	1,872.00	2,197
4,000 vitr. paving brick in place	249.60	295
55,000 No. 1 common brick in place	1,716.00	2,036
750 cu.ft. Bedford stone trim	3,510.00	3,861
115 cu.yd. conc. floors, steps, base and roof slabs	1,794.00	2,560
46 squares roof tailing, including copper flashing	2,152.80	2,500
24 tons structural steel	2,059.20	2,206
1,115 sq.ft. steel sash	892.00	1,032
710 sq.ft. glazing	333.70	412
42 ft. pipe railing	131.04	143
160 sq.yd. plastering	312.00	331
One steam heating plant, complete	2,894.58	3,380
Electric wiring, complete	468.00	839
Carpentry work, complete	1,014.00	970
Calcimining and painting	390.00	497
Plumbing, complete	780.00	1,156
One 6-in. water supply well and pump	1,950.00	2,246
450 cu.yd. conc. for building and machinery foundations	7,020.00	9,000
One reinf. conc. wet well	4,680.00	5,591
One reinf. conc. discharge chamber	4,680.00	5,323
One portland cement conc. outfall bulkhead	2,340.00	3,410
Two underground steel storage tanks	3,900.00	4,254
Two two-cycle, 270-hp., diesel oil engines	28,080.00	33,221
One 6-hp. gasoline engine	390.00	465
One 4¼x5-in. vertical starting air compressor	390.00	513
One 7½x6-in. horizontal vacuum pump	468.00	601
Two 48-in. horizontal screw pumps	12,480.00	15,266
One 20-in. horizontal screw pump	1,950.00	2,341
One 3-phase, 60-cycle, 220-volt, 50-hp. electric motor	936.00	1,073
Two 54-in. c.-i. suction pipes and fittings	3,588.00	4,225
One 20-in. c.-i. suction pipe and fitting	375.00	441
One 48-in. c.-i. discharge pipe and steel support and beams	3,900.00	4,355
One 48-in. c.-i. discharge pipe	1,872.00	2,113
One 20-in. c.-i. discharge pipe	624.00	801
Two 48-in. hand-operated and electrically operated gate valves	4,680.00	5,624
One 20-in. hand operated and electrically operated gate valve	936.00	1,068
One recording liquid gage	390.00	430

Cost of Mechanical Trades for Springwells Filtration and Pumping Plant, Detroit

CONTRACTS for heating, ventilating, plumbing and electric work for Springwells pumping plant and filter station were let as contracts GC-2 (electric) and GC-3 (heating, etc.) in June, 1930. Superstructure costs, together with an index to unit prices on other contracts of this project, were published in the July 24 issue of *Engineering News-Record*, p. 157.

These two contracts are to be handled together more or less with the general contract on the buildings awarded to the Bryant & Detwiler Co. The prices are lump sum. For this reason and because the work is quite special for structures of this nature, the prices are given as percentages of the total cost. Completion is by June 1, 1931.

The pumping plant is heated by unit heaters concealed in the walls of the building. Most of these are located under windows. Direct radiation is placed in the pipe vaults and in the pump pits. This contract does not include the fans for ventilating the pumping plant, which will be placed on another contract, but includes all necessary air ducts. The purpose of the fans is to force fresh air into the bottom of the pump pits; exhaust fans will draw out the heated air from the top of the building.

MECHANICAL COSTS

Pumping Station	Contract Prices	Average Lowest Three Bidders
Heating and ventilating	$61,929	$62,300
Plumbing	7,242	8,360
Elec. conduit and lighting	78,340	78,500
Total mechanical	$147,511	$149,160
Filter Building		
Heating and ventilating	$57,463	$58,700
Plumbing	3,650	3,560
Elec. conduit and lighting	59,450	59,500
Total	$120,563	$121,760

MECHANICAL COSTS AND THE TOTALS

Costs	Total Costs Pumping Station	Filter Building
Structure	$966,036	$1,198,018
Mechanical	147,511	120,563
Total	$1,113,547	$1,318,581

MECHANICAL COSTS

Per Cent of Total Cost		
Heating and ventilating	5.66	4.36
Plumbing	.65	.28
Lighting	7.03	4.50
Total mechanical	13.34	9.14
Heating and ventilating Per sq.ft. of radiation	$1.51	$1.415

The heating system in the filter building consists of four fans drawing air from the building and from out of doors. The air will be forced by the fans through cast-iron heater elements and thence delivered to the filter building at four different points over the top of the galleries. There will be a small amount of direct radiation in the water galleries to prevent cold drafts on the operating floors. The basis of design is to heat the filter building in zero weather to a temperature of 50 deg. About one-third of the heat delivered to the filter building is carried away by the cold water in the filter beds. The air for heating is regulated so that 80 per cent of the warm air is recirculated and the rest is fresh air drawn through heaters under thermostatic control. The fans and heaters are located above the operating floor in the filter building. Radiation amounts to 40,520 sq.ft.

The plumbing system consists of roof conductors, sewer lines and water service lines.

The successful contractor for the heating, ventilating and plumbing systems is J. W. Partlan, 14290 Goddard Rd., for $130,284; for the electric conduit and lighting systems, Iron City Engineering Co., 1240 Michigan Theater Bldg., $137,790.

CONSTRUCTION NEWS

Some of the Week's Large Projects

For further details turn to the appropriate sections in this issue

Location	*Project*	*Cost*	*Status*
Waterworks			
Colorado Springs	Reservoir, pipe line	$1,750,000	Proposed
Bridges			
Cleveland	Bridge steel work	1,210,950	Contract
Vancouver (B.C.)	Bridge	3,000,000	Bids asked
Excav. and Dredging			
Brownwood (Tex.)	Irrigation, etc	2,500,000	Proposed
Unclassified			
Kansas and Colorado	Gas pipe line	2,500,000	Proposed
Factories and Mills			
Chicago	Factory	1,500,000	Owner builds
Power Plants			
Jasper (Ark.)	Hydro electric plant	1,000,000	Proposed
Ontario	Power development	20,000,000	Contract
Buildings			
New York	Apartment	1,400,000	Separate contracts
San Francisco	Club	1,500,000	Proposed
New York	Y. M. C. A.	1,000,000	Bids asked
New Haven	School	2,500,000	Contract
Cleveland	Department store	9,500,000	Bids asked
Oklahoma City	Theatre	1,000,000	Proposed
Indianapolis	Telephone exch	1,000,000	Proposed

WATERWORKS

PROPOSED WORK

Colo., Colorado Springs—City, c/o E. Mosely, mgr. power plant, reservoir, 12 in. pipe line from Crystal Creek to Ruxton Park Hydro-Electric plant. $1,750,000. F. O. Ray, city engr.

Ia., Osceola—Preliminary plans impounding dam, purification plant, 1½ mi. c.i. pipe line, etc. Brown Eng. Co., Ottumwa, engrs.

Ky., Paris—City plans waterworks plant, mains and equipment. $250,000.

Okla., Duncan — City, W. H. Hollingsworth, mgr., preliminary plans additional deep well, water supply. $20,000.

Okla., Perry—City, preliminary plans increasing water supply. $18,000. P. Daniels, Perry, engr.

BIDS ASKED

Calif., Beverly Hills—Sept. 9, by B. J. Firminger, city clk., extending 6,980 ft. 16 in. c.i. mains, carbonized equipment and installation of same for water treatment plant.

Calif., San Diego—See "Streets and Roads."

Calif., Yreka—Sept. 4, by U. F. Brown, city clk., 2,920 ft. 2- to 8-in. Class 150 bell and spigot pipe, with miscellaneous fittings.

Ill., Chicago—Sept. 4, by City at office Bd. Local Impvts., City Hall, c.i. water supply pipes, special castings, c.i. fire hydrants, valves, brick valve basins in West 82nd Pl., West 79th St., North Long, North Moody, North Nordica, South Laramie, Rascher, Wentworth, North Whipple, South Seely, South Hoyne, and South Hamilton Aves. M. J. Faherty, pres.

Md., Baltimore—Sept. 10, by Bd. Awards, constructing Prettyboy Dam. E. G. Rost, water engr.; adv. E. N.-R. Aug. 28.

Mich., Detroit—Sept. 2, by Bd. Water Comrs., Water Bd. Bldg., 735 Randolph St., part substructure and complete superstructure office and laboratory building, for Springwells Station, at West Warren Ave. at Detroit Terminal Railroad, Dearborn; adv. E. N.-R. Aug. 28.

N. Y., Colonie—Sept. 5, by Comrs. Lathams Water Dist., at Pitts Hose Company, Lathams, Colonie, 20,700 lin.ft. 6 in. c.i. mains, valves, hydrants. Solomon & Keis, 257 Bway., Troy, consult. engrs.; adv. E. N.-R. Aug. 28.

N. Y., Long Island City—Sept. 2, by J. J. Dietz, comr. Water Supply, Gas & Electricity, Municipal Bldg., New York, mains in Station and 77th Rds., 63rd, 83rd, 84th Pls., 31st, 47th, 63rd, 78th and 68th Aves., Bourton, Carlton, Dartmouth, Ingram, 71st, 78th, 80th, 82nd and 83rd Sts.

O., Brook Park (br. Cleveland)—Sept. 3, by Village 4,400 ft. 6 and 8 in. c.i. mains in Brook Park Rd. $15,000. Wight ORourke Co., Guarantee Title Bldg., Cleveland, engrs.

O., Canton—Bd. Control bids about Nov. 11, developing northwest water field, drilling wells, 10 mi. 6- to 24-in. mains. $500,000. L. Ohliger, Canton, engr.

O., Cleveland—Sept. 3, by Comrs. Cuyahoga Co., 12,000 ft. 6- to 16-in. c.i. mains in Water Main Impvt., 563, Warrensville Center Rd. W. J. Rogers, Ulmer Bldg., engr. Noted July 31.

Tenn., Nashville—Sept. 2, at office S. H. McKay, furnishing, installing 24 m.g.p.d. electric motor-driven centrifugal pumping unit for Nashville River Pumping Station, for Bd. P. Wks. H. E. Howse, mayor.

Tex., Brownwood—See "Excavation, Drainage, Irrigation, Levees, River and Harbor."

Wash., Anacortes—Sept. 5, by W. C. Morse & Co., engrs., Smith Tower, Seattle, waterworks, incl. intake pier in Skagit River, requiring 380 cu.yd. concrete, screen chamber, 175 yd. concrete, pump house, 30 ft. diam.; 10 ft. deep, lined with superimposed structure 15 ft. diam.; 20 ft. high, incl. 223 cu.yd. concrete, 12 24 in. steel, centrifugal concrete or creosoted wood pipe, 21,700 ft. steel, 30, 123 ft. steel, also coagulating basin with valve house, pipe fittings, 1,250,000 gal. equalization reservoir. $400,000.

CONTRACTS AWARDED

Calif., Whittier—For 1,700 ft. 30 in. I. D. electtric welded steel pipe, to Western Pipe & Steel Co., 5717 Santa Fe Ave., Los Angeles, at $4.50 per ft. (McEverlast treated).

Colo., Denver—Bd. Water Comrs., 1509 Cleveland Pl., Eleven Mile Canon Arch Type Concrete Dam, 112 ft. high, in South Park 130 mi. from here, to Gordon Constr. Co., 31st and Platte Sts., $469,506. Noted July 31.

Colo., Meeker—City, improving waterworks to J. F. Spotts Constr. Co., Loveland; valves, hydrants, and accessories to Hendrie-Bolthoff, 1639 17th St., Denver—steel storage tank to Kansas City Structural Steel Co., 21st and Metropolitan Ave., Kansas City, Mo.—cast iron and steel pipe and fittings for distribution system to Pacific States Cast Iron Pipe Co., Provo, Utah—and flow line and fittings to U. S. Pipe and Fdry. Co., 604 Interstate Bldg., Kansas City, Mo. Noted June 12.

Ia. Scranton—For 11,900 ft. 2- and 4-in. mains, hydrants, valves, to C. W. Roland Co., 1347 8th St., Des Moines. Est. $30,000. Noted Aug. 14.

Mass., Gloucester—Bd. Water Comrs., pumps for waterworks, to Power Equipment Co., 250 Stuart St., Boston. Est. to exceed $15,000. Noted June 19.

Miss., Indianola—For 3,000 ft. 6 and 8 in. c.i. mains, pumps, to Dunn Constr. Co., Jackson, and Lincoln Life Bldg., Birmingham, Ala., $13,477; 100,000 gal. tank on 100 ft. tower fittings, to R. D. Cole Mfg. Co., Newman, Ga., $5,846. Noted July 17.

N. Y., Douglaston—J. J. Dietz, comr. Water Supply, Gas & Electricity, Municipal Bldg., New York, remodeling Pumping Station 8, to M. J. Irwin & Son, 48-70 37th St., Long Island City, $25,597. Noted Aug. 7.

O., Wooster—Bd. Control, 300,000 gal. storage reservoir in Bloomington area, to Pittsburgh-Des Moines Steel Co., Neville Island, Pittsburgh, Pa., $25,000. Est. $30,000. Noted July 31.

Pa., Pittsburgh—City, City-County Bldg., pumping unit, accessories, at Herron Hill Pumping Station, to Dravo Doyle Co., 302 Penn Ave., $11,250.

Pa., Pittsburgh—Repairing, improving water lines on Manchester Bridge, to W. S. Rae, Oliver Bldg., $10,930. Est. $15,000.

R. I. Warwick—City, booster pumping station, Contr. 7, to Hanson & Erickson, Greenwood Ave., Greenwood, $21,223. Est. $15,000. Noted July 31.

Que., Montreal—Improving waterworks, incl. 1½ mi. two 36 in. mains from McTavish St. Reservoir to Notre Dame de Grace Upper Level Reservoir and Cote des Neiges Reservoir, also laying new pipes to Montreal East, to Atlas Constr. Co. Ltd., 37 Belmont St., $815,523 and $212,032 respectively. Noted July 31.

SEWERS

PROPOSED WORK

Ark., Harrison—Preliminary plans 74,710 ft. 6- to 15-in. sewers, 166 manholes, 6 flushtanks, disposal tank. Dickinson & White, Little Rock, engrs. Noted June 20.

Ill., Dupo—Sewerage system. $99,000.

Ind., Gary—Sewage treatment plant. $90,000. J. Hayes, Gary, engr.

Ind., Salem—Sewage disposal plant, sewers. $111,000.

Ind., South Bend—Bd. Wks. sewage treatment plant. $120,000. Burns & McDonnell, Interstate Bldg., Kansas City, Mo., engrs.

Mass., Boston—Commonwealth of Massachusetts, Metropolitan Dist. Comn., 1 Ashburton Pl., extending existing marginal conduit and other drainage overflows, Beach and Park improvements, Charles River embankment. $250,000.

N. J., Nutley—Town Comrs., Town Hall, plans storm water sewer in Harrison St., $33,000. G. R. Hartley, town engr.

N. Y., Brooklyn—H. Hesterberg, pres. Brooklyn Boro, Boro Hall, rejected bids July 30, sewers in Avenue X. Will readvertise. Noted July 24.

Okla., Barnsdall—Preliminary plans sanitary sewer extensions in Birch, Maple and Elm Sts. $25,000. H. M. Curnutt, Barnsdall, engr.

Wis., Milwaukee—Sewerage Comn., plans 3 to 15 M. G. D. return sludge pumps, incl. motors, valves, pipe and venturi meter. $45,000. R. Cramer, ch. engr.

BIDS ASKED

Ala., Birmingham—Sept. 2, by A. J. Hawkins, city engr., sanitary sewers, appurtenances, Ordinance 1349-D.

Calif., San Francisco—Sept. 3, by S. J. Hester, secy. Bd. P. Wks., City Hall, Alemany Storm Drain, Sect. C—138,000 lin.ft. timber piling, rein.-con. sewers and vitr. clay underdrains, manholes, $148,000; Sect. D—16,200 lin.ft. timber piling, wood box and vitr. clay sewers, manholes. $60,000.

Calif., Oakland—Sept. 4, by F. C. Merritt, city clk., main outlet sewer extension, incl. 40.92 lin.ft. 36 in. rein.-con. and 15.42 ft. steel pipe with concrete saddle and timber foundations, 495 lin.ft. wood-stave pipe with steel bands, 700 lin.ft. piling. W. Frickstad, city engr.

Calif., San Diego—See "Streets and Roads."

Ind., Richmond—Sept. 5, by Bd. P. Wks., "B" Street Relief and "C" Street Storm Sewers. $165,000. W. P. Edmondson, chn.

La., New Orleans—Oct. 1, by Sewerage & Water Bd. at office A. G. Moffat, secy., 526 Carondolet St., Contr. 116-D, riveted steel pipes for Drainage Stations 3 and 7; Contr. 117-D, trunk type switchboards, motor generators, transformers and accessories, for Stations 3 and 7; Contr. 210-D, lined canal in Florida Ave. between Louisa St. and Drainage Pumping Station 3 at London Ave. G. G. Earl, genl. supt.

Md., Baltimore—Sept. 3, by Bd. Awards, 1,186 ft. 27 and 30 rein.-con. drains; 1,500 lin.ft. 4 and 6 in. underdrains; 540 lin.ft. 15, 18 and 21 in. vitr. drains, Storm Water Contr. 140. M. J. Ruark, Municipal Bldg., sewerage engr.

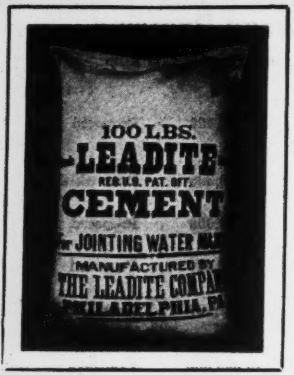
N. Y., Mamaroneck—Sept. 5, by Bd. Sewer Comrs., Sewer Dist. 1, Edgecomb Rd., Mamaroneck (P.O. address Larchmont), 1 glass enclosed sludge bed. A. J. Foote Eng. Corp., 2 North Chatsworth Ave., Larchmont, engr.; adv. E. N.-R. Aug. 28.

See proposal advertising on page 97

Constr. News page 83

LEADITE

Trade Mark Registered U.S. Pat. Office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LEADITE
REG. U.S. PAT. OFF.
CEMENT
for JOINTING WATER MAINS
MANUFACTURED BY
THE LEADITE COMPANY
PHILADELPHIA, PA.

Melts Easily

Melting LEADITE prior to pouring joint.

Handles Conveniently

First and foremost, LEADITE makes a good, tight joint,—and, it "speeds-up" bell and spigot pipe laying, thereby helping to make the water line a revenue producer, well within the specified time allowance.

The reasons LEADITE "Speeds-up" pipe laying may be briefly summarized as follows: 1st. LEADITE requires no caulking. 2nd. LEADITE reduces the time required for digging large bell holes. 3rd. LEADITE takes less time and heat to melt. 4th. LEADITE, being light in weight, is easy and quick to handle. 5th. LEADITE reduces the cost of trench pumping in wet trenches. In fact, LEADITE reduces the cost of practically every item in bell and spigot water pipe joint making.

Water Works Men most everywhere have used LEADITE for many years under varying conditions and pressures—for jointing bell and spigot water mains from 4 in. to 84 in. diameter, and for various pressures.

Pours Freely

Pouring the LEADITE joint.

The Pioneer self-caulking material for c. i. pipe.
Tested and used for over 30 years.
Saves at least 75%

THE LEADITE COMPANY
Land Title Building Philadelphia, Pa.

100 LBS.
LEADITE
REG. U.S. PAT. OFF.
CEMENT
for JOINTING WATER MAINS
MANUFACTURED BY
THE LEADITE COMPANY
PHILADELPHIA, PA.

No Caulking

Sewers (Continued)

N. Y., New York—Sept. 5, by J. Miller, pres. Manhattan Boro. Municipal Bldg., altering, improving sewer in Fulton St.; constructing storm overflow at South St. and East River.

O., Columbus—Sept. 9, by W. H. Duffy, dir. Serv., 2,100 ft. 11 ft. 9 in., 2,900 ft. 10 ft. 3 in. concrete or brick sewers, for Relief Sewer 2-2. $628,000. R. H. Simpson, City Hall engr.

CONTRACTS AWARDED

Ala., Birmingham — City Comn., 16 blocks sanitary concrete sewers 18th to 32nd Sts., and to Red Mountain, to Hornebuckle Constr. Co., 1309 Ave. L. $57,641 est. $93,000; 6 blocks 32nd, 33rd, 34th, 35th Sts. and Avenues O and R, to A. H. Dimijian, Woodward Bldg., $4,857 est. $7,300.

Calif., Los Angeles—Los Angeles Co., 8,000 ft. Vernon Extension Trunk Sewer in Co. Sanitation Dist. 1, to M. T. Markovich, 1295 Stanley Ave., Long Beach, $30,015.

Kan., Abilene—M. E. Calkins, city clk., City Hall, main sewers and laterals to Asplund Constr. Co., Enid, Okla., $18,288 and $2,575 respectively—sewage disposal plant, to J. J. Carrothers, 905 Lincoln Ave., Topeka. Dorr Equipment, $50,013. Harding equipment $47,013. Noted July 17.

Mass., Boston—Dept. P. Wks., J. A. Rourke, comr., City Hall, sewers in Dale St., West Roxbury, to A. D. Daddario, 15 Agnes Ave., Mattapan, $29,204. Est. $25,000. Noted July 24.

Mass., Boston—Dpt. P. Wks., J. A. Rourke, comr., sewerage works in Green Hill Ave., West Roxbury, to N. Sannella & Son, 74 Moraine St., Jamaica Plain, $27,040. Noted Aug. 7.

Mass., Marblehead—City, sewers, 50 manholes, 60 steps, to E. L. LeBaron Co., Commercial Yard, Brockton; sewerage, to H. V. Gould, 126 Sidney St., Cambridge; general work, to Mogavero Co., 6 Dane St., Peabody; certain construction, to Cenedella & Co., 167 Main St., Milford. Exceeds $25,000. Noted July 31.

N. Y., Long Island City—G. U. Harvey, pres. Queens Boro, Queens Subway Bldg., to A. Capasso, 865 Liberty Ave., Brooklyn, sewers in 71st Pl. $1,593, Sutphin Blvd. $5,694, 120th Ave. $19,574; to Kennedy-Smith, Bradford St., Flushing, Stoutenburgh St. $6,807 and Weisse Ave. $13,227; to J. H. Johnson, 37 Britton Ave., Elmhurst, 192nd St., $13,901; from Flushing Contg. Co., 66 Wyoming Ave., Forest Hill, 133rd St., $28,081; to Goddard & Latigo, 122-01 165th St., Jamaica, 164th St., $1,756; to P. Tomassetti, 1074 60th St., Brooklyn, 194th St., $24,606; to DiSalvo Contg. Co., 2552 99th St. E., Elmhurst, $15,425; to J. Deliso, 9839 Old South Rd., Jamaica, 212th St., $2,885; to J. L. Sigretto, 100 Bway., New York, Beach 35th St., $32,560, from R. Iovino, 678 Glenmore Ave., Brooklyn, 25th Ave., $270. Grand total $166,379. Noted Aug. 14.

N. Y., New York—W. J. Flynn, acting pres. Bronx Boro, Crotona Park, 3rd and Tremont Aves., sewers in Tremont Ave. to Clemente Contg. Co., 1193 Spofford Ave., $745,685—in Paulding Ave., to Coddington Avenue Constr. Co., 2883 Coddington Ave., $2,092. Noted Aug. 7.

O., Shaker Height (br. Cleveland) — Village, concrete box culvert, Kingsbury Run, to C. L. Moore, 14630 Strathmore Ave., Cleveland, $27,260.

Pa., Edgewood—Boro. W. V. Foust, pres., Boro Bldg., concrete culvert, to M. O'Herron Co., 1st Ave. and McKean St., Pittsburgh, $14,304; gravel and cinders, to H. Ferrone, Center Ave., Oakmont, $2,720. Est. $25,000. Noted Aug. 7.

Pa., Phila.—Dpt. P. Wks., Bureau Eng. & Surveys, A. Murdock, dir., City Hall Annex, to Corrodo & Froselone, 6045 Magnolia St., branch sewers in Anderson St. and Cresheim Ave. $28,728; to A. Franzi, 513 High St., Argyle St. $2,983; to E. Vantresco, 6018 Ross St., Greenwood Ave. $6,026, Belfield Ave. $5,451; to P. Pinciotti, 4103 Roosevelt Blvd., Brighton and Princeton Sts. $9,300, Oakley St. $8,633, Palmetto St. $8,673; to Garson & Garson, 6146 Lebanon St., Harrison St. $13,958; to Campellone & Dioric, 3856 North 10th St., Limekiln Pipe $12,009; to V. Neemand, 628 Lerick St., Pratt St. $1,476; to Iorio & Amaroso, 141 North Gross St., Rhoads and Rockland Sts., $12,083 Uber St. $8,165; to Visco & DiSaniro, 609 West Rising Sun Ave., 16th St. $4,437, 12th St. $8,133; to Achione Contg. Co., 1607 McKean St., main sewers in Roosevelt Blvd., Princeton Ave., Calvert and St. Vincent Sts., $67,028. Grand total $197,083. Bids for Schedule C withdrawn. Noted July 31.

Tex., Sealy—E. L. Dalton, Wilson Bldg., Dallas (franchise holder) complete sanitary sewerage system, incl. 30,000 lin.ft. vitr. sewer pipe, disposal plant, day labor. $45,000.

Wis., Milwaukee — Metropolitan Sewerage Comn., special section main sewer in Row, Underwood Creek Parkway and Lovers Lane, to H. Hohensee, 431 Ludington Ave., Wauwatosa, $129,395; 54 in. concrete main sewer in Row, Morris Blvd. and East Capitol Dr., to Clayton Constr. Co., Pt. Washington and Gruber Sts., $62,971; sanitary and storm sewers in North 31st St., to Werner Co., 721 8th Ave., Wauwatosa, $1,438; West Stark St., to Zimmerman & Zimmerman, 2826 State St., $39,223. Grand total $233,027.

BRIDGES

PROPOSED WORK

Ark., DeQueen — Texarkana & Fort Smith Ry., W. G. Morgan, ch. engr., Texarkana, preliminary plans rein.-con., steel bridge across Little River at Morris Ferry.

Calif., Los Angeles—Comrs. Los Angeles Co. plan seven 60 ft. rein.-con. arch or steel plate girder bridge, 60 ft. roadway, two 5 ft. walks, over Los Angeles River, Atlantic Ave. $200,000. W. B. Armstrong, Hall of Records Bldg., engr.

Ill., Joliet — A. Cohen, supt. Purchase & Constr. Illinois Waterways, Springfield, receiving competitive designs bridges (movable) over Illinois River, near here.

Pa., Pittsburgh—Allegheny Co. Comrs., plan replacing bridge 6, over Painters Run, near Bridgeville, $22,000—plan bridge over Chartiers Creek, Bridgeville, $150,000—Bridge No. 1, near Tarentum, over Little Bull Creek, $25,000—and Bridge No. 2, over Falls Timber Run, near Elizabeth, $29,000. V. R. Covell, 519 Smithfield St., co. engr.

BIDS ASKED

Alabama—Sept. 9, by State Hy. Dpt., Montgomery, 9 concrete bridges on hys. in Jefferson Co. W. Finnell, hy. dir.

California—See "Streets and Roads."

Illinois—Sept. 10, State Dpt. P. Wks. & Buildings, Div. Hys., Springfield, temporary bridge, widening existing bridge, Route 4, Sect. QYB Madison Co.—one 20 ft. and one 30 ft. rein.-con. slab bridges Route 48, Sect. 113-B Ford Co.—four 50 ft. span rein.-con. girder bridge, one 30 ft. rein.-con. slab bridge, Route 48, Sect. 124-B De Witt Co.—48 ft. rein.-con. girder bridge, 30 ft. rein.-con. slab bridge, Route 104, Sect. 139-B Sangamon Co.—three 50 ft. span concrete bridge, two 28 ft. span rein.-con. girder bridge, 2 rein.-con. bridges, one single and one double box culverts, Route 121, Sect. 135-B, 120 ft. steel superstructure, Route 121, Sect. 135-C Macon Co.—40 ft. rein.-con. girder bridge, Route 122, Sect. 127-B Tazewell Co.—three 35 ft. span rein.-con. girder bridge, six 49 ft. rein.-con. substructure, two 48 ft. span substructure, and 8 steel I-beam approach spans Route 140, Sect. 113-B, 200 ft. steel superstructure, Route 140, Sect. 113 C Gallatin Co.—one 40 ft., one 50 ft. and three 35 ft. span rein.-con. girder bridge, Routes 146 and 150, Sect. 102-B Union Co.—30 ft. rein.-con. slab bridge, three 40 ft. steel I-beam bridge on concrete piles, Route 160, Sect. 139-B Bond Co. F. T. Sheets, ch. hy. engr.

Illinois—Sept. 10, by State Dpt. P. Wks. & Buildings, Div. Hys., Springfield, three 52 ft. span rein.-con. girder bridge, three 53 ft. span temporary bridge, Route 18, Sect. 7-B, one 45 ft. and two 26 ft. span rein.-con. girder bridge, Route 19, Sect. 70-H, three 63 ft. span rein.-con. bridge, Route 19, Sect. 86-Y-B and ten 55 ft. span, rein.-con. girder bridge, Route 49, Sect. 144-H, all Cook Co.—86 ft. plate girder span, two 56 ft. and two 45 I-beam spans, Route 49, Sect. 143V-B, two 45 ft. span rein.-con. substructure, Route 53, Sect. 535-B-1, 75 ft. span steel superstructure, Route 53, Sect. 535C-1, Will Co.—rein.-con. substructure, Route 62, Sect. 115-B and three 110 ft. span steel superstructure, Route 62, Sect. 115-C, McHenry Co.—rein.-con. substructure, Route 99, Sect. 1058, three 150 ft. span steel superstructure, Route 90, Sect. 105-C McDonough Co. F. T. Sheets, ch. hy. engr.

Iowa—Sept. 2, by State Hy. Dpt., Ames, 80 x 20 ft. deck truss bridge with two 40 x 20 ft. I-beam approach spans, 60 x 20 ft. pony truss bridge with two 32 x 20 ft. approach spans, two 70 x 20 ft. pony truss spans, 6 arch and 3 box culverts, Rd. 25, B-646, Guthrie Co.—28 x 24 ft. I-beam bridge on wood pile abutments, 21 culverts, extensions, Rd. 13, B-443, Linn Co.—three 164 x 24 ft., two 20 x 24 ft., two 24 x 24 ft., three 32 x 24 ft. and two 40 x 24 ft. I-beam spans on wood pile abutments, two 90 x 20 ft., pony trusses each with three 40 x 20 ft. I-beam approach spans, 5 culverts, extensions, Primary Rd. 35, B-638, Monona Co.—box culvert Rd. 59, B-654, Howard Co.—9 concrete box culverts, extensions, Primary Rd. 159, B-692, Keokuk Co. R. F. White, hy. engr.

Kentucky — Sept. 18, by State Hy. Dpt., Frankfort, one 360 ft. and two 224 ft. steel truss spans, three 60 ft. and six 43 ft. steel I-beam spans, rein.-con. piers, abutments over Kentucky River near Tyrone, Anderson Co.—two 320 ft. and two 120 ft. steel truss spans, forty-eight 45 ft. steel I-beam spans, steel towers, rein.-con. piers, abutments over Cumberland River at Canton, Trigg Co.—one 366 ft., three 320 ft. and two 150 ft. steel truss spans, thirty-eight 45 ft. steel I-beam spans, steel towers, rein.-con. piers, abutments over Tennessee River at Eggners Ferry—two 769 ft., two 382 ft. and six 98 ft. steel truss spans, twelve 34 ft. 6 in. concrete girder spans, rein.-con. piers, abutments, retaining walls over Ohio River at Carrollton, Carrol Co. B. Johnson, chn.

Ky., Red Mills—See "Excavation, Drainage, Irrigation, Levees, River and Harbor."

La., Natchez—Sept. 2, by Supers. Adams Co., additions to concrete span bridge, over St. Catherine Creek, on Lower Natchez and Woodville Rd.

La., Tallulah—See "Streets and Roads."

Maryland—Sept. 3, by State Roads Comn., Baltimore, substructure for bridge Contr. H-99-42, Harford Co.—steel superstructure, Contr. H-100-42, Harford Co.—substructure, concrete floor approaches, for proposed grade elimination Contr. AA-75-73, Anne Arundel Co. L. H. Stuart, secy.; adv. E. N.-R. Aug. 28.

Michigan—Sept. 4, by R. R. Havens, resident engr., Jackson, MB1 of 23-16-31, Contrs. 1 and 2, three 60 ft. span steel deck girder, 2 rein.-con. abutments, Eaton Co., for State Hy. Dpt., Lansing.

Minn., Rochester—Sept. 9, by State Hy. Dpt. St. Paul, Bridge 4942, 2 span 140 ft., concrete.

Miss., Grenada — Sept. 5, by Bd. Supervs. Grenada Co., 57 bridges; 9,000 lin.ft. treated piling, 27,000 ft. treated and 8,000 ft. untreated lumber. W. E. Johnson, Grenada, engr.

N. H., Franklin—Sept. 4, by State Hy. Comn. Concord, 5 span 381 ft. deck plate girder bridge. $75,000.

New Jersey—Sept. 15, by State Hy. Dpt., Trenton, 3 bridges on Route 34, Sect. 2, Monmouth Co.; furnishing, erecting structural steel on Route 25, Connecting Link, Sects. 3 and 6, Hudson and Essex Counties. A. L. Grover, ch. clk.; adv. E. N.-R. Aug. 28.

N. J., Paterson—Bd. Freeholders Passaic Co., Court House, taking bids steel, concrete bridges at Rutzer Rd., Wayne and High Mountain Rds., Wayne and Haledon. $25,000. G. Ferguson, Court House, engr.

New York—Sept. 2, A. Goldman, comr. Plant & Structures, Municipal Bldg., New York, altering Manhattan and Brooklyn Plazas vehicular roadway for westerly upper deck Manhattan Bridge.

New York—Sept. 10, by Westchester Co. Park Comn., 72 West Ponderfield Rd., Bronxville, 2 stone faced rein.-con. bridges at Kitchawan Rd. and at underpass south of Kitchawan Rd., Bronx Parkway extension, New Castle and Yorktown. J. Downer, Bronxville, ch. engr.; adv. E. N.-R. Aug. 28.

New York—Sept. 15, at office General Manager Port of New York Authority, 80-90 8th Ave., New York, constructing Riverside Drive connections New York approach to Hudson River Bridge, between Fort Washington, N. Y. and Fort Lee, N. J. J. F. Galvin, chn.; adv. E. N.-R. Aug. 28.

Okla., Goltry—Sept. 2, by L. B. Lewis, clk. Garfield Co., Enid, 8 span 98 ft., rein.-con. bridge. $25,000. C. B. Lewis, Enid, engr.

Okla., Lawton—Sept. 2, by F. P. Aycock, clk. Comanche Co., 80 ft. steel truss and two 40 ft. I-beam spans on concrete piers at Elgin, $25,000—one 60 ft., one 64 ft. and one 32 ft. span truss bridge on concrete piers at Cache, $37,000—1 span 140 ft. steel truss bridge on concrete piers at Richards, $30,000. S. Joyner, Lawton, engr.

Oregon—State Hy. Comn., Salem, bids about Oct. 1, constructing bridge over Jalmas Inlet, Roosevelt Highway, Curry Co. $300,000. R. Klein, comr.

Pennsylvania—Sept. 8, by Lehigh Co. (Allentown) and Northampton Co. (Easton), steel, concrete bridge over Lehigh River, Lehigh Valley R.R., Central R.R. of New Jersey, Lehigh Coal & Navigation Co. Canal between Apley and Northampton Boros. $600,000. Address Engineer Lehigh Co., Allentown.

Pa., Pittsburgh—Sept. 2, by R. G. Woodside, controller Allegheny Co., disposing of existing bridge, new rein.-con. bridge at Flaughertys Run, $52,000—paving bridge, approaches Moss Side Blvd., $45,000—removing existing pavement and base course, concrete repaving, 16th St., $25,000. V. R. Covell, 519 Smithfield St., engr.

South Carolina—Sept. 4, by State Hy. Dpt., Columbia, 12 bridges in Beaufort, Chester, Greenwood, Horry, Lancaster, Marlboro, Newberry Counties. B. M. Sawyer, ch. hy. comr.

Washington—Sept. 2, by S. J. Humes, dir state Hys., Olympia, bridge over Hoh River

West Virginia—Sept. 3, at office State Bridge Comn., Second Unit, State Capitol, Charleston, substructure, superstructure Point Pleasant-Henderson Bridge, at Point Pleasant, and St. Albans-Nitro Bridge at St. Albans, both over Kanawha River. E. D. Yewell, Box 1356 Charleston, engr. J. E. Greiner Co., 1201 St. Paul St., Baltimore, Md., consult. engrs.

B. C., Vancouver—Oct. 31, by City Council, 2,817 ft. concrete girder slab bridge, 80 ft. over False Creek. $3,000,000. J. R. Grant, 500 Beatty St., engr. Noted July 24.

CONTRACTS AWARDED

Illinois—State Dpt. P. Wks. & Buildings, Div. Hys., Springfield, bridges in Du Page Co., to Davidson & Doctor, Orland Park, $12,662—Jo Daviess Co., to R. C. Mann, 2331 Charles St., Rockford, $56,081—LaSalle Co., to Powers-Thompson Constr. Co., Joliet, $9,894—Shelby, Fayette and Effingham Counties, to Clinton Bridge Wks., Clinton, Ia., $77,068—Christian Co., to Vincennes Bridge Co., Vincennes, Ind., $8,138—Christian Co., to V. O. Connor, Newton, $47,070. Grand total $210,913.

Maryland—State Roads Comn., Baltimore, triple span steel and concrete bridge, at Kensington, Montgomery Co., to Ligon & Ligon, 3310 Ridgewood Ave., Baltimore, $20,764. Noted June 19.

Massachusetts — Commonwealth of Massachusetts, State House, Boston, repairing 31 timber bridges, over Southern New England R.R. tracks, between and including Brimfield and Blackstone, to M. M. Devine, 141 Milk St., Boston, $20,220. Noted July 31.

Mass., Hudson — Commonwealth of Massachusetts, Dpt. P. Wks., Boston, rein.-con. bridge, bituminous macadam approaches, to A. M. Custance, 4 Shawmut Ave., $18,910. Noted Aug. 7.

New Jersey—State Hy. Comn., Trenton, constructing fenders, removing existing fenders Route 10, Sect. B, Contr. 39, Hackensack River, Newark Turnpike, Hudson Co., to Nutley Constr. Co., Nutley, $57,186. Noted July 31.

Constr. News page 83a

Bridges (Continued)

N. Y., Croton — J. J. Dietz, comr. Water Supply, Gas & Electricity, Municipal Bldg., New York, reconstructing Hunters Brook Bridge over Croton Lake, to J. Roman, 122 Livingston St., Brooklyn, $41,300. Noted Aug. 7.

O., Cleveland—Comrs. Cuyahoga Co., erecting 11,700 tons structural steel for Lorain-Central Bridge, to Mt. Vernon Bridge Co., Mt. Vernon, $1,219,950. Noted July 17.

Oklahoma—State Hy. Dpt., Oklahoma City, 6 span 106 ft. rein.-con. bridge, at Seminole, Seminole Co., to J. J. Harrison, Lindsay, $22,119 est. $25,000—3 span 90 ft. concrete girder bridge at Lawton, Comanche Co., to Dan Sweeney, 614 West 11th St., Oklahoma City, $17,936 est. $25,000—2 span 260 ft. steel truss bridge on concrete piers at Pawhuska, Osage Co., to Gravelle & Hamblin, Manhattan Bldg., Muskogee, $35,809 est. $40,000—6 span 266 ft. steel truss and I-beam bridge on concrete piers at Altus, Jackson Co., to South West Culvert Co., Hales Bldg., Oklahoma City, $28,217 est. $32,000. Grand total $104,081.

Pa., Pittsburgh — Bd. P. Wks., City-County Bldg., bridge over Monongahelia River at 22nd St., to W. S. Rae, Oliver Bldg., $22,475 est. $30,000; repaving Herrs Island Bridge, to Aloe Hanson Co., Grant Bldg., $6,656 est. $8,000. Noted Aug. 7.

Tennessee—See "Streets and Roads."

Tex., Dallas — Northern Texas Traction Co., c/o F. M. Townsend, Fort Worth constructing street car viaduct over new channel Trinity River, to Oak Cliff, to Austin Bros., 1815 Coombs St., $500,000. Noted June 19.

Que., Gaspe—Dpt. P. Wks., Quebec, 800 ft. bridge connecting town with harbor, to Gaspe Bridge Co., Gaspe, $500,000. Noted Mar. 20.

STREETS AND ROADS

BIDS ASKED

Arizona — Sept. 3, by State Hy. Comn., Phoenix, grading 5.6 mi. Yuma-Wellton Rd., Yuma Co. W. W. Lane, Phoenix, state engr.

California—Sept. 3, by C. H. Purcell, engr. State Hy. Comn., Sacramento, grading 4.1 mi. Redwood City-Willow Road Rd., San Mateo Co. —also seven 35 ft. span rein.-con. girder bridge across Castaic Creek near Castaic Junction, Los Angeles Co.

Calif., San Diego—Sept. 8, by City Council, improving 54th St. et. al. in Balboa Vista. H. W. Jorgensen, City Hall, engr.

Calif., San Francisco—Sept. 3, by S. J. Hester, secy. Bd. P. Wks., City Hall, grading 84,000 cu.yd., asphaltic macadam surfacing 92,000 sq.ft. Sect. B-Sunset Blvd. $90,000.

Florida—Sept. 8, by State Road Dpt., Tallahassee **(P. means Project)**, improving 32.78 mi. Ps. 677, 667-B, 741, and 876-C, Levy, Alachua, Duval and St. Johns Counties—single bituminous on 8 in. compacted Florida lime rock paving 25,000 sq.yd. Ps. 892 and 951, Indian River Co.—40,887 sq.yd. P. 770, Brevard Co.—22,300 sq.yd. P. 915, Palm Beach Co.—clearing, grubbing, grading, bridging 1.07 mi. P. 608-B, Brevard Co.—9.04 mi. P. 869, Glades Co.—surface treating 9.64 mi. P. 720, Jefferson Co. B. M. Duncan, state hy. engr.

Illinois—Sept. 10, by State Dpt. P. Wks. & Buildings, Div. Hys., Springfield, concrete bituminous filled brick on concrete, bituminous concrete (fine or coarse graded aggregate type) on concrete surfacing 0.34 mi. Route 5, Sect. 14-R Boone Co.—0.75 mi. Route 18, Sect. 8Y-X, 1.98 mi. Route 63, Sect. 631-X, 2.53 mi. Route 49, Sect. 144 X, 18 mi. Route 55, Sect. 551-X-1 and 2.84 mi. Route 49, Sect. 146 Cook Co.—7.97 mi. Route 53, Sect. 534 Will and Dupage Counties—2.34 mi. Route 60, Sect. 118 Lake Co.—0.18 mi. Route 64, Sect. 130-V-2-X DuPage Co.—8.71 mi. Route 66, Sect. 121 Will Co.—3.28 mi. Route 91, Sect. 108-X Peoria Co.—grading 3.13 mi. Route 19, Sect. 70-A-2 Cook Co. F. T. Sheets, ch. hy. engr.

Illinois—Sept. 10, by State Dpt. P. Wks. & Buildings, Div. Hys., Springfield, traffic bound macadam or crushed stone surfacing 4.9 mi. Route 48, Sect. 113 Iroquois and Ford Counties —5.04 mi. Route 48, Sect. 123 and 8.13 mi. Route 48, Sect. 124 Dewitt Co.—1.33 mi. Route 104, Sect. 126-X Morgan Co.—8.49 mi. Route 104, Sect. 139 Sangamon Co.—12.26 mi. Route 121, Sect. 135 Macon Co.—6.17 mi. Route 122, Sect. 126 and 9.12 mi. Route 122, Sect. 127 Tazewell Co.—0.3 mi. Route 126, Sect. 111X and 0.25 mi. Route 126, Sect. 116 X Montgomery Co.—3.5 mi. Route 129, Sect. 106 Shelby Co.—5.05 mi. Route 131, Sect. 108 Cumberland Co.—4.6 mi. Route 142, Sect. 105X, 8.96 mi. Route 142, Sect. 108, 5.48 mi. Route 182, Sect. 101X and 3.29 mi. Routee 182, Sect. 102, Marion Co.—8.96 mi. Route 142, Sect. 109 Marion and Jefferson Counties—6 mi. Route 142, Sect. 110 Jefferson Co.—10.96 mi. Route 142, Sect. 114, 7 mi. Route 142, Sect. 115 and 4.16 mi. Route 142, Sect. 116, Hamilton Co.—2.52 mi. Route 147, Sect. 122-G Pulaski Co.—0.21 mi. Route 169, Sect. 114-S Shelby Co.; grading 2.79 mi. Route 140, Sect. 113-A Gallatin Co.—1.52 mi. Routes 146 and 150, Sect. 102-A Union Co.—2.23 mi. Route 160, Sect. 139 A Bond Co. F. T. Sheets, ch. hy. engr.

Ill., Chicago—Sept. 4, by City at office Bd. Local Impvts., City Hall, grading, sewers, concrete paving 1 alley—grading, curbing, guttering, sewers, 8 in. concrete paving 82nd Pl., East 82nd, Roscoe and School Sts., South Claremont, Crandon, Kearsarge, Cornell, East End, Ridgeland, Transit, Elliott, Nottingham, Cornelia and South Racine Aves.—grading, curbing, guttering, removing trees, 10 in. concrete paving Indiana Ave.—grading, reshaping present macadam paving for foundation, asphaltic concrete repaving West 64th St.—grading, curbing guttering, sewers, asphalt on 6 in. concrete paving West 80th and South La Salle Sts., Estes, Greenleaf and Normal Aves. M. J. Faherty, pres.

Constr. News page 84

Ill., Chicago—Sept. 8, at office J. C. Russell, supt. Cook Co. Pub. Serv., grading, concrete paving Touhy Ave. and Madison St.; adv. E. N.-R. Aug. 28.

Ind., Brazil—Sept. 2, by Bd. Comrs. Clay Co., graveling Stearley and Diel Rds. $34,046. R. E. Barnhart, Brazil, aud.

Ind., Columbia City—Sept. 4, by Bd. Comrs. Whitley Co., at office R. F. Raber, aud., Court House, graveling L. Lincoln Lee Hy., et al, Cleveland and Washington Twps. $34,138.

Ind., Decatur—Sept. 2, by Bd. Comrs. Adams Co., concrete surfacing William Aumann Rd. $25,921. A. Harlow, Decatur, aud.

Ind., Evansville—Sept. 4, by Comrs. Vanderburgh Co. Gostile-Nurrenben Rd., Perry Twp. $27,399 and Keck Ave. Rd., Pigeon Twp., $30,608. S. B. Bell, Evansville, co. aud.

Ind., Ft. Wayne—Sept. 10, by Comrs. Allen Co., concrete paving 4 mi. Hicksville Rd., 18 ft. $111,000. A. W. Grosvenor, Ft. Wayne, engr.

Ind., Goshen—Sept. 8, by Bd. Comrs. Elkhart Co., concrete surfacing 3,900 ft. D-6 Road, graveling 6,573 ft. C-6-Road, Concord Twp. $31,600.

Ind., Lafayette—Sept. 6, by Bd. Comrs. Tippecanoe Co., concrete surfacing Edwin Gault Rd., Fairfield Twp. $65,000. C. M. Davis, Lafayette, aud.

Ind., Laporte—Sept. 1, by Comrs. Laporte Co., concrete paving 2 mi. Otto Schultz Rd. $48,500. E. L. Alexander, Laporte, engr.

Ind., Madison—Sept. 1, by Bd. Comrs. Jefferson Co., graveling 12,300 ft. Mathews Rd. and 21,137 ft. Lichlyter Rd. $28,190. H. E. Wells, Madison, aud.

Iowa—Sept. 2, by State Hy. Dpt., Ames, grading 0.152 mi. U. S. Rd. 90, P-30 Boone Co.—1.848 mi. Primary Rd. 159, P-692 Keokuk Co.—4.864 mi. Primary Rd. 13, P-443 Linn Co.—grading, paving 1.789 mi. Primary Rd. 3, P-136 Fremont Co.—0.253 mi. U. S. Rd. 30, F-211-E Marshall Co.—0.552 mi. U. S. Rd. 34, F-15 Mills Co.—0.405 mi. U. S. Rd. 30, F-276 and 1.837 mi. U.S. Rd. 30, F-303 Tama Co.—graveling 4 mi. Primary Rd. 134, P-636 Mills Co.—21.703 mi. Primary Rd. 12, F-210 Plymouth Co. —281,830 lin.ft. cable guard rail, 1,300 end anchors, rounding 20,000 posts in various counties in Dist. 9. State furnishes posts and 140,000 ft. cable. R. F. White, ch. hy. engr.

Ia., Emerson—Sept. 2, by H. E. Greenwood, city clk., grading, brick or bituminous on concrete paving 11,600 sq.yd. Henningson Eng. Co., 326 Union State Bank Bldg., Omaha, Neb., engrs.

Ky., Red Mills—See "Excavation, Drainage, Irrigation, Levees, River and Harbor."

La., Tallulah—Sept. 2, by Police Jury Madison Co. concrete headwalls, culverts, creosoted timber structures, graveling 5.24 mi. roads, near here. P. O. Benjamin, Tallulah, engr.

Maryland—Sept. 3, by State Roads Comn., Baltimore, concrete paving 0.38 mi. Contr. AA-100-74, Anne Arundel Co.—1 mi. Contr. Wi-66-12, Wicomico Co.—penetration macadam surfacing 3 mi. Contr. H-82-42, Harford Co.—penetration macadam resurfacing 1.46 mi. Contr. HO-83-54, Howard Co.—sheet asphalt paving 0.9 mi. Contr. BC-92-74, Baltimore City—hot or cold bituminous mixture paving 1.4 mi. Contr. B-163-411, Baltimore Co. L. H. Stuart, secy.; adv. E. N.-R. Aug. 28.

Maryland—Sept. 4, by State Roads Comn., Baltimore, constructing 1.9 mi. Contr. S-44-12, Somerset Co. L. H. Stuart, secy.; adv. E. N.-R. Aug. 28.

Md., Towson—Sept. 2, by Comrs. Baltimore Co., concrete paving 0.92 mi. Roads Group 9, Seminary Ave. from Dulanys Valley Rd., east. S. A. Green, Court House, roads engr.

Massachusetts—Sept. 2, by Dpt. P. Wks., State House, Boston, rein.-con. or bitulithic concrete paving 1,237 ft. hy. and bituminous paving 2,549 ft. hy. Swampscott—bithulithic and gravel surfacing 9,170 ft. Acton—bituminous macadam paving 3,900 ft. Rockport—rein.-con. paving 2,356 ft. Andover. A. W. Dean, Dpt. P. Wks., engr.

Mass., Boston—Dpt. School Buildings, taking bids, grading, paving in Poplar St. Washington Irving School grounds, West Roxbury. Est. $25,000.

Michigan—Sept. 2, by E. R. Benkert, resident engr., Port Huron, grading, concrete paving 5.009 mi. FO44-25, Contr. 1, 20 ft., Lapeer Co., for State Hy. Dpt., Lansing.

Michigan—Sept. 3, by E. R. Benkert, resident engr., Port Huron, grading, two course gravel surfacing 1.821 mi. Assessment Dist. 501, Contr. 1, Macomb and St. Clair Counties, for State Hy. Dpt., Lansing.

Michigan—Sept. 3, by E. R. Benkert, resident engr., Port Huron, grading, concrete paving 7.063 mi. FO32-36, Contr. 1, Huron Co., for State Hy. Dpt., Lansing.

Michigan—Sept. 3, by E. R. Benkert, resident engr., Port Huron, grading, two course graveling 3.994 mi. Assessment Dist. 497, C-1, Sanilac and St. Clair Counties, for State Hy. Dpt., Lansing.

Michigan—Sept. 3, by E. R. Benkert, resident engr., Port Huron, grading, two course graveling 4.957 mi. MO79-28, C-1, Tuscola Co., for State Hy. Dpt., Lansing.

Michigan—Sept. 3, by H. C. Fleming, resident engr., Grand Rapids, grading, concrete paving 2,556 mi. MO41-26, C-4, and 2 underpasses MO41-31, C-2, Kent Co., for State Hy. Dpt., Lansing.

Michigan—Sept. 3, by H. C. Fleming, resident engr., Grand Rapids, grading, concrete paving 6.372 mi. MO59-24, Contr. 3, Montcalm Co., for State Hy. Dpt., Lansing.

Michigan—Sept. 4, by R. A. Beers, resident engr., Kalamazoo, grading, concrete paving 12.183 mi. FO-11-30, Contr. 1, Berrien Co., for State Hy. Dpt., Lansing.

Michigan—Sept. 4, by E. R. Benkert, resident engr., Port Huron, grading 8.439 mi. MO77-4, Contr. 1, and 8.189 mi. MO77-4, Contr. 2, St. Clair Co., for State Hy. Dpt., Lansing.

Michigan—Sept. 4, by E. D. Crandall, resident engr., Cadillac, grading, two course graveling 13.81 mi. FO51-7, 1, 21 ft., Mainstee Co., for State Hy. Dpt., Lansing.

Michigan—Sept. 5, by C. L. Cowgill, resident engr., Plymouth, grading, concrete paving 9.101 mi. Assessment Dist. 491, Contr. 1, Monroe, Washtenau and Wayne Counties, for State Hy. Dpt., Lansing.

Michigan—Sept. 9, by G. H. Greene, resident engr., Alpena, grading, concrete paving 4.166 mi. F016-19, C-1, 20 ft., Cheboygan Co., for State Hy. Dpt., Lansing.

Miss., Canton—Sept. 2, by Madison Co. Hy. Comn., grading, grubbing, drainage structures 19 mi. road in Dist. 4; furnishing 20,000 tons gravel for above district. W. H. Bradley, Canton, engr.

Neb., DuBois—Sept. 1, by City Clerk, grading, curbing, guttering, alternate types paving 9,100 sq.yd., paving Miner St. Henningsen Eng. Co., Union State Bank Bldg., Omaha, Neb. engrs.

Nevada — Sept. 3, by Directors Dpt. Hys., Carson City, improving 12.62 mi. road from California-Nevada line to Jean, Route 6, Sect. A, Clark Co. S. C. Durkee, state hy. engr.

New Hampshire—Sept. 4, by State Hy. Dpt., Concord, 3 in. on 5 in. gravel surfacing 0.75 mi. Central Rd., Concord, 21 ft. $40,000.

New Jersey—Sept. 15, by State Hy. Dpt., Trenton, grading, paving 4.144 mi. Route S-41, Sect. 4, Cooper Road-White Horse Pike, Camden Co.; 4.5 mi. Route 4, Sect. 3, Hackensack River-Fort Lee Rd., Bergen Co. A. L. Grover, ch. clk.; adv. E. N.-R. Aug. 28.

N. J., Belvidere—Sept. 10, by Bd. Freeholders Warren Co., Court House, grading, bridging, concrete paving 38,030 sq.yd. Warren Glen-Alpha Rd. and Shimers Corner-Straw Church Rd., Pohatcong Twp.., H. W. Vetter, co. engr.; adv. E. N.-R. Aug. 28.

N. J., Plainfield—Sept. 2, by Bd. Freeholders Union Co. Court House, Elizabeth, grading, curbing, sheet asphalt on concrete or 9 in. rein.-con. paving 25,630 sq.yd. Park Ave. $140,000. R. Collins, Court House, Elizabeth co. engr.

New York—Sept. 9, by A. W. Brandt, comr. Hys., Albany, improving hys. in Clinton, Delaware, Schoharie, and Sullivan Counties; reconstructing hys. in Cattaraugus, Chenango, Columbia, Herkimer, Nassau, Oswego, Rensselaer, Schenectady and Steuben Counties; adv. E. N.-R. Aug. 28.

N. Y., Hamburg—Sept. 2, by W. G. Hickman, County Hall, rein.-con. paving 2.08 mi. McKinley Parkway Extension S., Part 3. G. Diehl, Ellicott Sq., engr.

N. Y., Moravia—Taking bids concrete paving Church St. $35,000.

N. Y., Northampton—Sept. 15, by Bd. Hudson River Regulating Dist., 44 Howard St., Albany, constructing 3.6 mi. dirt hy. E. H. Sargent, ch. engr.; adv. E. N.-R. Aug. 28.

O., Cincinnati—Sept. 5, by Comrs. Hamilton Co., asphalt bound macadam repaving 6,000 sq.yd. Washington Rd., 16 ft., $25,286; concrete repaving 42,500 sq.yd. Foley Rd., 20 ft., $176,446. E. A. Gast, Court House, engr.

O., Cleveland—Sept. 3, by Bd. Comrs. Cuyahoga Co., paving Linndale Park Rd. $297,600. F Williams, Court House, engr.

O., Dayton—Aug. 29, by City Comn., rein.-con. paving, sewers 4,700 ft. Kiser and Adelite Sts., 30 ft. $65,000. J. F. Hale, city engr.

O., Napoleon—Sept. 5, by Comrs. Henry Co., E. T. Crawford, aud., grading, waterbound macadam paving 8 mi. Rohrs, Harms, Jennings, and Johnson Rds., 18 ft. $57,000.

Okla., Texola—Sept. 2, by L. Barnard, city clk., grading, 6 in. concrete paving 7,800 sq.yd. Main St. $25,000. F. Ford, Cordell, engr.

Okla., Oklahoma City—Sept. 2, by M. Peshek, city clk., widening, curbing, sheet asphalt paving 13,000 sq.yd. East 23rd St. $67,000. G. F. Brown, City Hall, engr.

Pa., Indiana—Sept. 1, by Bd. Comrs. Indiana Co., improving 5.5 mi. County Aid-White Twp. Rd., to Sample Run, incl. 8,000 tons traffic bound slag, Cherry Hill Twp. T. Pealor, Boro Bldg., engr.

Pa., Phila.—Sept. 2, by Bureau Hys., Dpt. P. Wks., A. Murdock, dir., City Hall Annex, Schedule A, asphalt paving (assessment work) 3 streets—Schedule B, redressed granite block repaving intersections 12 streets and avenues—Schedule C, curbing, footway work 5 hys.

Streets and Roads (Continued)

Pa., Phila.—Sept. 3, by Dpt. P. Wks., Bureau Eng. & Surveys grading, paving, sewers, Germantown and Chestnut Hill Elevated—University Bridge Approach, 34th St. over Schuylkill River—Pennsylvania Terminal Improvement, deck, Arch St. viaduct. A. Murdock, dir. P. Wks.

Pa., Pittsburgh—See "Bridges."

Pa., Pittsburgh—Sept. 2, by R. G. Woodside, controller Allegheny Co., rein.-con. paving Turtle Creek-Munroeville Rd. (Hill Route) 18 to 30 ft.; $151,000; grading, furnishing, planting trees, shrubs, vines, grass, top-soiling Ohio River Blvd. and McKees Rocks Bridge Approaches, $105,000. A. E. Griffith, 519 Smithfield St., Pittsburgh, engrs.

Pa., Westmont (mail Johnstown)—Sept. 1, by H. P. Shomo, secy., Project 1, grading, rein.-con. paving 1,500 cu.yd. 11th Alley—Project 2, grading, retaining wall, rein.-con. paving 2,000 cu.yd. West St.—Project 3, sewers, grading, rein.-con. paving 3,500 cu.yd. Kemmer St. O. P. Thomas, 145 Franklin St., Johnstown, engr.

Tex., Hereford—Bids after Sept. 1, alternate types paving 20 blocks. $75,000. Montgomery & Ward, 545 Harvey-Snider Bldg., Wichita Falls, engrs.

Tex., Houston—Sept. 2, by Harris Co., H. L. Washburn, aud., grading, culverts, concrete paving 3.392 mi. Crosby-Dayton Rd., 18 ft. C. R. Haile, Houston, co. engr.

Washington—Sept. 9, by S. J. Humes, dir. Hys., Olympia, grading crushed stone surfacing 3,950 cu.yd. Stevens Pass Hy., Summit East, Chelan Co.

Wash., Seattle—Sept. 8, by Comrs. King Co., constructing 1.16 mi. Dumas Bay-Lakato Rd.; grading, concrete paving 1.6 mi. Perm. Hy. 65, 20 ft. $35,000. T. D. Hunt, Seattle, engr.

Wisconsin—Sept. 3, by State and Brown Co. Hy. Comns., Court House, Green Bay, concrete paving 1.77 mi. Green Bay-Sturgeon Bay Rd.

Wisconsin—Sept. 4, by State and Marathon Co. Hy. Comns., Wausau, grading, concrete paving 10.04 mi. Abbottsford-Wausau Rd., F. A. P. 445-C.

Ont., Windsor—A. Desmarais, engr., City Hall, taking bids concrete paving 1 mi. Ottawa St., 45 ft. $70,000.

CONTRACTS AWARDED

Arkansas—State Hy. Comn., Little Rock, grading, drainage structures 6 mi. roads in Pike Co., and 7 mi. Logan Co., to G. W. Nickels & Son, Hot Springs, $57,497 and $65,808 respectively—concrete paving 5 mi. White Co., to G. Garms, Rector Bldg., Little Rock, $73,392—7 mi. Greene Co., to J. P. McNulty, Pine Bluff, $130,733. Grand total $327,430.

California—State Hy. Comn., Sacramento, concrete paving 5.4 mi. Balboa Avenue-Torrey Pines Rd., to Jahn & Bressi Constr. Co., 724 South Spg. St., Los Angeles, $171,425; grading 12.9 mi. Sonora Junction-Coleville Rd., Mono Co., to Kennedy-Bayles Constr. Co., Biggs, $161,510.

Calif., Los Angeles—Grading, curbing, walks, asphaltic concrete paving El Camino Real, to Heincke Constr. Co., 714 West 10th St., $293,867; grading, asphalt on concrete paving La Cienega Blvd. and Adams Street Improvement Dist., to G. R. Curtis Paving Co., 2440 East 26th St., $47,665.

Calif., Los Angeles—Bd. P. Wks., City Hall, paving 12,752 ft. 117th St. and Denver Ave., Impvt. Dist., to G. H. Oswald, 366 East 58th St., $149,369. Noted Aug. 7.

Calif., Los Angeles—Bd. P. Wks., City Hall, grading, curbing, concrete paving 220,000 sq.ft. Olive St., to Griffith Co., Railway Bldg., $373,930. Noted July 24.

Calif., Salinas — Grading, concrete paving Archer St., to Granite Constr. Co., Watsonville, $27,907.

Calif., San Francisco—Grading, asphaltic concrete paving Castro Street Addition, to C. B. Eaton, 715 Ocean Ave., $46,338.

Idaho—Commissioner P. Wks., Boise, surfacing 7.24 mi. Oneida Co., to Allsop & Pond, Grace, $21,750—5.713 mi. Benewah Co., to J. F. Konen, Lewiston, $55,361—2.634 mi. Kootenai Co., to D. A. Sullivan & Co., Dillon, Mont., $33,753. Grand total $110,864. Grading, surfacing 11.074 mi. Cassia Co. award deferred for court decision.

Illinois—State Dpt. P. Wks. & Buildings, Div. Hys., Springfield, contracts awarded from Aug. 1 to Aug. 15 to Cameron-Joyce & Co., Keokuk, Ia., paving roads in Bureau Co. $53,584; Mercer Co. $17,095—to S. Jaicks, Oak Park, Dupage Co. $134,954—to E. M. Rocho, Freeport, Jo-Daviess Co. $96,498—to R. Mann, Freeport, Lee Co. $8,219; Bureau Co. $7,907; Whiteside Co. $3,356; De Kalb Co. $145,784—to W. F. Sell, Pana, Marion Co. $3,443—to W. F. Wier Constr. Co., Moline, Ogle Co. $2,402—to Bishop Constr. Co., Danville, La Salle Co. $33,696—to S. J. Groves & Sons, 306 Globe Bldg., Minneapolis, Minn., Lake Co. $23,290; Tazewell Co. $156,939—to Hartmann-Clark Bros., 920 Peoria Life Bldg., Peoria, Route 105, Sect. 105 Adams Co. $95,205; Sect. 104 $106,269; La Salle Co. $91,823; Bureau Co. $6,552—to Central Eng. Co., 809 Putnam Bldg., Davenport, Ia., Rock Island Co. $134,102—to Bishop Constr. Co., Danville, Henry Co. $40,972—to Broadway Constr. Co., 205 West Wacker Dr., Chicago, Cook Co. $28,494—to J. C. O'Conner & Sons, Ft. Wayne, Ind., Ford Co. $108,733; Knox Co. $87,893— to Birt Bros., Decatur, Piatt Co. $13,369; Grundy Co. $7,330—to Triangle Constr. Co., Kankakee, Kankakee Co. $7,912—to R. C. McCalman, Inc., Danville, Christian Co. $107,275—to E. J. Eiff, Quincy, Mercer Co. $93,557; Mercer and Henry Counties $68,285—to J. I. Ransom, Palestine, White Co. $6,781; White and Gallatin Counties $81,860; Gallatin Co. $101,377—to Wabash Constr. Co., Vincennes, Ind., Pulaski Co. $142,920—to Chicago Heights Coal Co., Chicago Heights, Will and Cook Counties $204,515—to McCarthy Impvt. Co., Kahl Bldg., Davenport, Ia., grading roads Henry Co. $49,267—to Burch Constr. Co., Madison, Wis., Marion Co. $18,225—to Globe Constr. Co., Evansville, Ind., Shelby, Fayette and Effingham Counties, $68,105—Grand total $2,357,988. Noted July 3, 24 and 31.

Ill., Chicago—Bd. Local Impvts., City Hall, grading, curbing, guttering, sewers, asphalt on 6 and 8 in. concrete paving West 54th St., South Kilpatrick and South California Aves., to R. F. Conway Co., 884 Rush St.—Indiana Ave., to American Asphalt Paving Co., 120 South La Salle St.—Jarvis Ave., to Barber Paving Co., 7 South Dearborn St.—grading, curbing, guttering, sewers, 8 and 10 in. concrete paving South Damen Ave., to Home Paving Co., 134 North La Salle St.—West 55th St., to Hedges Constr. Co., 64 West Randolph St.,—North Hermitage Ave., to P. J. O'Brien & Co., 4 North Cicero Ave.—McCleod Ave. and Norwood St., to Paramount Constr. Co., 82 West Washington St.

Ill., Chicago—Cook Co., County Bldg., rein.-con., paving 33,317 sq.yd. Central Ave., to Bates Constr. Co., Chicago, $50,156—15,695 sq.yd. 195th St. and 51,364 sq.yd. South West Hy., to J. P. O'Keefe Co., 7854 South Ashland Ave., $78,597 and $123,163 respectively—14,948 sq.yd. Potter Rd., to Arcole Constr. Co., Evanston, $30,052. Grand total $281,968. Noted Aug. 7.

Ind., Newcastle — Henry Co. concrete paving 2.26 mi. E. G. McQuinn Rd., to W. L. Magaw, Richmond, $40,332.

Iowa—State Hy. Dpt., Ames, grading, flumes, paving 4.05 mi. F.A.-64 and 0.684 mi. P-520, Jasper Co., to Booth & Olson, Sioux City, $67,403 and $11,072 respectively—grading 0.695 mi. Crawford Co., to G. W. Condon Co., Grain Exch. Bldg., Omaha, Neb., $11,281—riprap on roads in Des Moines and Henry Counties, to F. W. Gunther, Burlington, $3,350 and $1,428 respectively — 127,370 lin.ft. cable guard rail and 724 anchors in earth fill, rounding 13,000 posts in various counties Dist. 1, to G. Cronkhite, Perry, $23,812. Grand total $118,346.

Ia., Carroll — At office Auditor Carroll Co., graveling secondary and 11 mi. trunk roads, to McDougall Constr. Co., Sioux City, $4,813 and $11,972 respectively—trunk road between Hillsdale and Halbur, to H. R. Maudlin, Nevada, $3,760—4 mi. Willey-Dedham Rd., to C. A. Emery, Carroll, $1,163. Grand total $21,708. Noted July 24.

Ia., Hampton—Franklin Co., to Paul & Donnelly, Ft. Dodge, graveling 15.2 mi. roads at $0.25 per cu.yd., 77,300 units overhaul $0.05—to Washington Wood Preserving Co., 954 McKnight St., Minneapolis, Minn., 25,637 ft. creosoted lumber—to Carter-Waters Corp., 215 Old Colony Bldg., Des Moines, [illegible]520 ft. creosoted piling—to Independence Corrugated Culvert Co., 310 South Madison Ave., Mason City, and Klauer Mfg. Co., 9th and Washington Sts., Dubuque, 6,990 ft. corrugated metal pipe, $22,680.

Ia., LeMars—At office Auditor Plymouth Co., grading county road system, to G. W. Condon, Omaha, Neb., $12,762; gravel surfacing trunk road system, to Evans Constr. Co., Early, $15,959.

Ia., Newton—Jasper Co., graveling secondary road system, to L. W. Hayes, Bethany, Mo., $27,664.

Ia., Northwood—At office Auditor Worth Co., graveling 13 mi. secondary roads, to E. G. Johnson, Kensett, $2,955; 15 mi., to Moe & Nelson, Belmond, $5,575.

Ia., Waterloo—City Clerk, rein.-con. and compacted concrete paving 10,970 sq.yd., to C. W. Shirley, Waterloo, $32,385. Est. $33,423.

Louisiana—State Hy. Comn., Baton Rouge, grading, 4.4 mi., Feliciana Parish, to Stafford Bros., Franklinton, $12,655; 6.6 mi., Bossier Parish, to S. B. Boyd, Columbia, Miss., $21,093. Noted July 10.

Maryland—State Roads Comn., Baltimore, concrete shoulders on 2.1 mi. Prince Georges Co., to G. B. Mullin Co., 1296 Upshur St., Wash., D. C., $11,115—10.33 mi. Kent Co., to Field Barker & Underwood, Commercial Trust Bldg., Phila., Pa., $52,250—4.79 mi. Garret Co., to M. F. McCabe Co., Salisbury, Pa., $47,831—6.41 mi. Cecil Co., to P. D. Phillips & Bro., Salisbury, $20,949—amiesite paving 3.97 mi. Baltimore Co., to Baltimore Asphalt Block & Tile Co., 1320 North Monroe St., Baltimore, $34,808. Grand total $166,953. Noted Aug. 7.

Maryland — State Roads Comn., Baltimore, graveling 2 mi. Charles Co., to Southern Maryland Constr. Co., 20 East Lexington St., Baltimore, $20,438. Noted July 10.

Md., Baltimore—Bd. Awards, sheet asphalt paving 19,000 sq.yd. Contr. 559, to Baltimore Asphalt Block & Tile Co., 1320 North Monroe St., $74,586; concrete paving 12,700 sq.yd. Contr. 558, to Aiello Constr. Co., 4th and Dean Sts., $25,528.

Massachusetts — Dpt. P. Wks., State House, bitulithic concrete paving 3,970 ft. hy. Nantucket, to J. C. Ring, 20 Liberty St., Nantucket, $18,584—6,700 ft. Wareham, to S. W. Lawrence, Falmouth, $30,424—bituminous macadam paving 13,286 ft. Amherst and Pelham, to Kelleher Corp., Turners Falls, $50,031—gravel and bituminous macadam paving 4,700 ft. Berkeley, to Providence Road Constr. Co., 62 Laura St., Providence, R. I., $11,671. Grand total $110,710. Noted Aug. 14.

Massachusetts—Dpt. P. Wks., Boston, bituminous paving 6,500 ft. hy. Dighton, to E. F. Jones, 193 County St., Taunton, $30,767—7,100 ft. Agawana to Lane Constr. Corp., 134 State St., Meriden, Conn., $31,187—2,400 ft. Greenfield and gravel and bitulithic surfacing 2,300 ft. Bellingham and Mendon, to C. Bonazzoli & Sons, Hudson, $41,588 and $10,493 respectively—10,990 ft. Merrimac, to P. J. Holland, 24 Ames St., Lawrence, $22,364—gravel and bituminous macadam paving 4,885 ft. Sterling, to New England Rock Excav. Co., 107 Brighton Ave., Allston, $11,790—7,100 ft. Franklin, to Hagan-Thibodeau Constr. Co., 35 Waterman Ave., Eden Park, R. I., $18,999. Grand total $167,188. Noted Aug. 7.

Mass., Boston—Dpt. P. Wks., J. A. Rourke, comr., sheet asphalt or bitulithic paving Compton St., Wards 3 and 5, to J. J. McCarthy, 121 Boston St., Dorchester, $29,032. Noted Aug. 7.

Mass., Boston—Dpt. P. Wks., J. A. Rourke, comr., City Hall, sheet asphalt paving Washington St., Ward 17, to A. De Stefano & Son Inc., 288 Summer St., East Boston, $46,879. Noted July 31.

Mass., Boston—Dpt. P. Wks., J. A. Rourke, comr., City Hall, sheet asphalt paving Stoughton St., Wards 7 and 13, to A. G. Tomasello & Son, 250 Stuart St., $28,510.

Mass., Boston—Dpt. P. Wks., recut granite block paving Green St., Ward 3, to B. E. Grant Co., 100 Floyd St., Roxbury. Est. $25,000.

Mass., Boston — Dpt. P. Wks., bitulithic paving Chambers St., Wards 3 and 5, to W. G. C. Co., 27 School St., $20,641.

Mass., Newton—Bituminous macadam paving Walnut St., to John MacDonald Constr. Co., 250 Stuart St., Boston. Est. $25,000.

Michigan—E. R. Benkert, resident engr., Port Huron, grading, concrete paving 4.987 mi. MO79-32, C-1, Tuscola Co., to C. A. Handeyside Constr. Co., Detroit, for State Hy. Dpt., Lansing, $145,014. Noted July 24.

Mich., Detroit—To Detroit Asphalt Paving Co., 909 Transportation Bldg., concrete curbing 3½ in. sheet asphalt on 8 in. concrete paving 6,700 sq.yd. Rogge Ave., $21,041; 13,700 sq.yd. Rowe Ave., $43,992; 7,850 sq.yd. Harper Ave., $24,366—to Cooke Asphalt Paving Co., Penobscot Bldg., 3,180 sq.yd. Cheyenne Ave., $10,115. Grand total $99,514.

Mich., Flint—Genesee Co. Rd. Comn., paving 8.75 mi. Assessment Dist. 93, to H. C. Nelson, Muskegon, $223,524.

Missouri—State Hy. Bd., Jefferson City, to Knutson Bros., 3520 Main St., Kansas City, grading, widening, bridging, graveling, chats concrete, stone, surfacing, concrete stone paving 3,496 mi. Worth Co., $31,097; 2,948 mi. Grundy Co., $10,350—to Cameron, Joyce & Co., Keokuk, Ia., 12,347 mi. Knox Co., $91,176; 13.67 mi. Lewis Co., $67,259; 3.481 mi. Marion Co., $23,345—to Martin Wunderlich, St. Paul, Minn., 9.357 mi. Mercer Co., $17,551; 2.745 mi. Miller Co., $25,568; 4.206 mi. Putnam Co., $3,767—to F. Platte, Quincy, Ill., 7.887 mi. Randolph Co., $7,933—to P. G. Aldridge Constr. Co., 1310 State St., Kansas City, Kan., 2.652 mi. Ralls Co., $19,996; 3.064 mi. Audrian Co., $23,348—to McGlone & Walesby, Independence, 5.625 mi. Clark Co., $87,672—to Clark, Kearney & Stalk, Louisiana, 5607 mi. Marion Co., $114,173; 7.393 mi. Ralls Co., $188,796—to A. W. Moseley, Kansas City, 4.031 mi. Carroll Co., $23,625—to O. O. Fuller, Nevada, 4.913 mi. Cass Co., $24,962—to List & Weatherly Constr. Co., 416 Railway Exch. Bldg., Kansas City, 6.279 mi. Cass Co., $65,662; 4.55 mi. Jackson Co., $100,423—to E. Spitcaufsky, 1918 Baltimore St., Kansas City, 13.305 mi. Saline Co., $16,075—to E. C. Johnson Constr. Co., Carrollton, 4.193 mi. Carroll Co., $28,013; 4.053 mi. Callaway Co., $24,955—to M. E. Gillioz, Monett, 1.723 mi. Moniteau Co., $19,148—to Independent Constr. Co., Pittsburg, Kan., 0.406 mi. Barton Co., $29,832—to N. Davis, Sikeston, 4.007 mi. Stoddard Co., $29,657—to Central Paving & Constr. Co., 6161 Maple Ave., St. Louis, 1.668 mi. St. Louis Co., $37,818—to Koss Constr. Co., 2818-5th St., Des Moines, Ia., 3.317 mi. Lincoln Co., $34,549; 11.096 mi. Maries Co., $117,516. Grand total $1,264,266. Rejected bids Aug. 1, gravel surfacing 3.531 mi. hy. Maries Co. Noted July 31.

Mo., Sedalia—Pettis Co., graveling Kendrick Rd., to Harpstrite & Welliver, Spring Form, at $1.80 per yd.—Hickory Point Dist., to W. F. Farris and J. R. Guinn, Sedalia, $1.81—Brockman Rd., to A. W. Hampton and F. Brockman, Ionia, $0.78—Funk Rd., to J. Maltsbarger and Bishop, Spring Fork, $0.93—Blackwater Dist., to W. J. Menefee, Sedalia, $2. Total est. $50,000.

Mo., St. Louis—Bd. P. Serv., City Hall, grading, concrete paving Calvary Ave. to Skrainka Constr. Co., Security Bldg., $125,257—concrete paving Chippewa Ave. to J. F. McMahn, Buder Bldg., $66,913—asphaltic concrete paving East Iowa St. to Asphalt Paving Co., 1328 Sublette Ave., $35,193—Compton Ave. to Crean & Scott Constr. Co., 1243 Sublette Ave., $7,946. Grand total $235,299.

Neb., Omaha—City, art stone paving 6,407 sq.yd. Dists. 2383,3415, 2223, 2969, 3290 and 3398, to Louis S. Noble Constr. Co., 1530 South 10th St., $14,390—asphaltic concrete paving 4,017 sq.yd. 3 streets, to James J. Parks Co., 205 Bankers Savings Bldg., $12,477—6,304 sq.yd Tucker St. and 4 avenues, to F. L. Busche, 4118 North 30th St., $20,092—asphalt repaving, widening 9,115 sq.yd. Center St., to John Kern Constr. Co., 712 Union State Bank Bldg., $41,460—rein.-con., sewer in Storm Sewer 1063, Plant St., to Omaha Sewer Constr. Co., 4535 Parker St., $18,918. Grand total $107,337.

Nevada—State Hy. Comn., Carson City, grading, surfacing 23.22 mi. Elko Co., to Utah Constr. Co., Ogden, Utah, $117,684. Est. $135,853.

New Jersey—State Hy. Comn., Trenton, grading, granite block on concrete paving 3,650

Constr. News page 85

Streets and Roads (Continued)

sq.yd. Route 10. Sect. C. Contr. 35, Kearny, Hudson Co., to Allen N. Spooner & Son, Inc., Pier 11, North River, New York, N. Y., $19,-945. Noted July 31.

N. J., Elizabeth—Bd. Freeholders, Union Co., Court House, grading, curbing, sidewalks, rein.-con. paving Martine Ave., to L. DiFrancesco, 714 Central Ave., Westfield, $109,564.

N. J., Jersey City—Bd. City Comrs., City Hall, asphalt on concrete paving Clifton Pl. and Fairmount Ave., to Municipal Constr. Corp., 26 Veteran Sq. Est. $25,000. Noted July 31.

N. J., Milltown—Boro Council, Boro Hall, rein-con. paving Washington Ave. to C. Sebolt, Bordentown Ave., South Amboy, $44,858. Noted Aug. 8 "Daily."

N. J., Morristown—Bd. Freeholders Morris Co., Court House, curbing, guttering, bituminous concrete on concrete paving South St. and Morris Ave., to Gray Constr. Co., Franklin St. Est. $95,000. Noted July 31.

N. J., Sayreville—Bd. Freeholders Middlesex Co., County Record Bldg., New Brunswick, curbing, guttering, concrete paving Main St. to C. Sebolt, Bordentown Ave., South Amboy, $92,243.

N. J., New Brunswick—City Comn., City Hall, resetting curb, sheet asphalt on 6 in. concrete paving Codwise Ave. and Schuyler St., to Utility Constr. Co., 5 Spring St., $31,809. Est. $35,000.

N. Y., Long Island City—G. U. Harvey, pres. Queens Boro, Queens Subway Bldg., to Borough Asphalt Co., 1301 Metropolitan Ave., Brooklyn, asphalt paving 51st Ave., $7,725; 108th St., $10,984; Main St., $100,981—to Cleveland Trinidad Asphalt Paving Co., Flushing, 82nd St., $35,772—to Flushing Contg. Eng. Co., 59 Taaffe Pl., Brooklyn, 115th St., $71,183; granite block paving Skillman Ave., $23,070—to Welsh Bros. Contg. Co., 27 Purbis St., grading 165th St., $11,325—to P. K. Kelly Contg. Co., 60-9 Woodside Ave., Woodside, 55th Ave., $6,600—to Peace Bros. Inc., 57 North Lawrence St., Flushing, Sutphin Blvd., $17,667—to F. Soviero, 114th Ave., $15,807. Grand total $301,114. Noted Aug. 7.

N. Y., New York—W. J. Flynn, acting pres. Bronx Boro, Crotona Park, 3rd and Tremont Aves., to C. D. Beckwith, Inc., Seneca Ave., and Edgewater Rd., asphalt paving Yates Ave., $9,442; East 162nd St., $10,441; Liebig Ave., $14,497; East 183rd St., $4,878—to Courtland Foundation Co., 3157 Park Ave., grading Eastern Blvd., $67,601—to F. Mascali & Son, 645 East Tremont Ave., Fetley Ave., $4,329—to F. Gabriel, 2763 Reservoir Ave., Williamsbridge Rd., $9,441. Grand total $120,629. Noted Aug. 7.

N. Y., New York—J. Miller, pres., Manhattan Boro, Municipal Bldg., 4 in. granite block on concrete repaving 16th St., to St. George Paving Corp., 415 Lexington Ave., $17,479; sheet asphalt on concrete paving 114th St., to Charles D. Beckwith, Inc., Seneca Ave. and Edgewater Rd., $18,621. Noted Aug. 14.

N. Y., St. George—J. A. Lynch, Pres. Richmond Boro, Boro Hall, Aug. 20, bituminous paving Westcott Blvd., from C. M. Bristow, Lyndhurst, N. J., $21,604—Holland Ave., from J. E. Donovan, 2207 Richmond Terrace, Port Richmond, $15,806—Arthur Kill Rd., from J. Johnson Sons, 455 Bway., West New Brighton, $24,693. Noted Aug. 12 Daily.

O., Cleveland—City, curbing, grading asphalt paving 2,130 sq.yd. East 40th St. and 730 sq.yd. East 114th St., to Rieley Bros., The Arcade, $13,628 and $4,615 respectively—695 sq.yd. brick paving East 146th St., to Gould & Maybach, 16311 Saranec Rd., $4,232—1,390 sq.yd. West 39th St., to Highway Constr. Co., Builders Exch. Bldg., $8,346. Grand total $30,821.

Oklahoma—State Hy. Dpt., Oklahoma City, grading, drainage structures 11.399 mi. roads in Seminole Co., and 7.741 mi. Osage Co., to J. J. Harrison, Lindsay, $45,399 and $53,445 respectively ests. $50,000 and $60,000 respectively—5.57 mi. Comanche Co. and 8.924 mi. Jackson Co., to D. Sweeney, 614 West 11th St., Oklahoma City, $15,937 and $23,671 respectively, ests. $25,000 and $27,000 respectively—3.92 mi. Beckham Co. and 6.32 mi. Roger Mills Co., to Maney & Alley, Empire Bldg., Oklahoma City, $16,661 and $17,683 respectively, est. $25,000 each—grading, concrete surfacing 3.779 mi. Seminole Co., to Hyde Constr. Co., American Bank Bldg., Enid, $59,204 est. $60,000. Grand total $232,000.

Okla., Chickasha — C. A. Chincholl, city clk., grading, curbing, concrete paving 7 blocks, Dist. 49, to Edmiston Constr. Co., Chickasha, $32,-000. Est. $35,000. Noted July 17.

Okla., Sand Springs—Grading, paving 15 blocks residential streets, 30 ft., to Porter Constr. Co., 1st and Frisco Sts., Tulsa, $56,027. Est. $57,000.

Pennsylvania—State Hy. Dpt., Harrisburg, grading, bituminous surface treated macadam surfacing 7,316 sq.yd. Rye Twp., Perry Co., and 10,553 sq.yd. Plain Grove Twp., Lawrence Co., to Martin & Frownfelster, Camp Hill, $23,396 and $50,229 respectively—7,000 sq.yd. Armagh Twp., Mifflin Co., to Lord & Quigley, Mifflin, $12,543—grading, rein.-con. surfacing 12,834 sq.yd. Parks Twp., Armstrong Co., to State Constr. Co., New Kengsington, $89,238—29,818 sq.yd., Berks Co., to Chianchetti Constr. Co., Phila., $80,614—3,500 sq.yd. Jackson Twp., Greene Co., to McKee & Balazick, Jefferson, $40,252—7,030 sq.yd. Wayne Twp., Greene Co., to W. K. Reed, Waynesburg, $65,502. Grand total $361,774.

Pennsylvania—Cities of Sharon and Farrell, brick on concrete paving Beechwood Ave. between George and Idaho Sts. to J. McCaren & Son, Youngstown, O., $30,773.

Pa., Braddock—Improving Wood Way St. from 9th to 11th Sts., day labor, 50,000 brick, to McCrady Rodgers Co., Investment Bldg., Pittsburgh, $38 per 1,000.

Pa., Donora—Improving Waddell Ave., Sycamore and Allen Alleys, 1st, 2nd, 3rd, and 4th Sts., to Donora Constr. Co., 1st and 2nd Sts., $52,890.

Pa., Meadville — Asphalt resurfacing 3,600 sq.yd. and grading, sheet asphalt on concrete surfacing 5,200 sq.yd. Park Ave., curbing, brick on concrete surfacing 7,700 sq.yd. Terrace St., grading, curbing, guttering, 3 in. vertical fibre brick on 6 in. concrete surfacing 7,500 sq.yd. Park Ave., Seminary and Cherry Alleys, Allegheny, Boynton and Walnut Sts., to W. McIntyre & Son, 185 Budd St., Sharon, $76,052. Noted Aug. 2.

Pa., Phila.—Dpt. P. Wks., Bureau Eng. & Surveys, A. Murdock, dir., City Hall Annex, to Barber Asphalt Co., Hunting Park Ave., asphalt paving (assessment work) Cedar Park St. $4,487; Greenwood St. $16,848; Michener St. $9,151—to Union Paving Co., Broad and Stiles Sts., Rockland St. $4,077; Weikel St. $2,297, country road improving Ashwood, Crothers, Lisser, Mornen and 86th Sts., $17,950; Brunswick, Dickens, Dicks, Madison, 76th, 77th, and 79th Sts. $16,673; Erwig, Holstein, 77th and 79th Sts., $11,575; Frontenac and Hoffnagle Sts. $12,736; asphalt repaving Christian St. $6,171, Oxford St. $3,991, repressed granite block repaving Oxford St. $37,436; to Frank Mark Constr. Co., Castor Ave. and Winghocking St., country road improving Chandler St. $6,144. Grand total $149,536. Noted Aug. 7.

Pa., Somerset — Bd. Comrs. Somerset Co., Court House, 2 in. bituminous conerete paving 5 mi. Plank Rd., to Owen-Shaffer Co., Johnstown, $62,424. Noted July 17.

Pa., Westwood—Cambria Co., widening, curbing, guttering, sewers, rein.-con. paving 2nd Ave., Millcreek Rd., Luzerne and Tioga Sts., to Owen & Shaffer Co., 307 Bedford St., Johnstown, $14,-000; repairing curbs at intersections, new sidewalks, 13 catch basins, to C. Ressler, Johnstown, $12,626.

R. I., East Providence (br. Providence) — Town Council, grading 1,050 cu.yd., graveling 1,350 cu.yd., seal coating 7,500 cu.yd. Bishop Ave., to J. McCormick, 315 Taunton Ave., Providence. Est. exceeds $25,000. Noted Aug. 15.

Tennessee—State Dpt. P. Wks. & Buildings, Div. Hys., Springfield, grading, drainage structures 15.013 mi. roads in Lincoln Co., to C. G. Kershaw Constr. Co., Woodward Bldg., Birmingham, Ala., $106,082—5.53 mi. Lewis Co., to W. B. Williams & Son, Milan, $41,822—7.057 mi. Hickman Co. and 7.53 mi. Rhea Co., to Chandler Bros., Virgilina, Va., $118,105 and $61,666 respectively—4.662 mi. Cheatham Co. and 13.26 mi. Franklin Co., to J. Oman, Jr., Chamber of Commerce Bldg., Nashville, $132,-312 and $65,412 respectively—paving 8.231 mi. Knox Co., to J. L. Humbard Constr. Co., Knoxville, $155,019—7 timber bridges in McNairy Co., to W. G. Just, Jefferson City, $34,-622. Grand total $715,040. Noted Aug. 7.

Tennessee—State Dpt. Hys. & P. Wks., Nashville, concrete paving 10.616 mi. Martin-Kentucky State Line Rd., Federal Aid Project 213-A and B. S., Weakley and Obion Counties, to J. B. McCrary Eng. Corp., 1408 Citizens and Southern Bank Bldg., Atlanta, Ga., $179,226.

Tex., Houston—Harris Co., grading, limestone gravel surfacing 8.8 mi. Westheimer Rd., Sect. 3, 18 ft., to McKinney & Parmley, Nacogdoches, $106,943.

Tex., Port Arthur — Paving 59,320 yd., to Jagoe Constr. Co., Denton, $110,574. Noted July 31.

Vermont—State Hy. Dpt., Montpelier, rein.-con. paving 0.8 mi. hy. Bennington, to D. D. Snyder, Comee St., Gardner, Mass., $25,724.

Virginia—State Hy. Dpt., Richmond, paving 1.042 mi. Bedford Co., to S. E. Finley, 292 North Ave. N. W., Atlanta, Ga., $29,943—one course macadam surfacing 0.51 mi. Bedford Co., to John Bower, Overstreet & Nance Constr. Corp., Bedford, $14,411 — grading, drainage structures to bridges, Botetourt Co., to C. H. Hester, Greensboro, N. C., $28,298—grading, drainage structures, bridge approaches 0.378 mi. Nansemond Co. and relocating and Dardens Mill Pond, Southampton Co., to Blount & Hayman, Brodnax, $4,751 and $16,675 respectively. Grand total $94,078. Noted Aug. 7.

Va., Richmond—Asphalt on 6 in. base paving Main St., to McGuire & Rolfe, Electric Bldg., $27,492.

Washington — Dpt. Hys., Olympia, improving 3.694 mi. Skamania Co., to Union Bridge Co., 1001 Porter Bldg., Portland, Ore., $18,808—17.9 mi. King Co., to Goetz & Brennon, 914 Seaboard Bldg., Seattle, $32,673. Noted July 10.

Wash., Seattle—Comrs. King Co., concrete paving 61,000 sq.yd. 15th Ave. N.E., to Fiorito Bros., 3950 6th St. N.W. $103,355. Noted July 24.

W. Va., Charleston—Kanawha Co., improving Cabin Creek-Junction-Rondo Rd., to J. T. Scites & Co., Cabin Creek Junction, $58,464—Kelleys Creek Rd., to Brown & Floyd, Charleston, $70,-513—Dunbar-Sattes Rd., to G. T. Fogle, Charleston, $43,233—Johnson Rd., to J. M. Randish, Clarksburg, $8,879—Kanawha Two-Mile-Reichford Bridge Rd., to E. R. Mills, Charleston, $5,200. Grand total $186,289. Noted Aug. 7.

Wisconsin—State and Dane, Green, Price and Columbia Counties Hy. Comns., Madison, concrete surfacing 20,806 sq.yd. Stoughton-Madison-Portage Rd., U. S. 51, and 13,552 sq.yd. in Brooklyn, S.T. Hy. 92, S.A.P. 1339, to Quinn Constr. Co., Madison, $35,057 and $18,430 respectively; constructing Gilbert Bridge, U. S. 8, S.A.P. 7865, to R. W. Ohlfs, Ladysmith, $2,557. Grand total $56,044. Noted Aug. 8.

Wisconsin—State and Fond du Lac and Milwaukee Counties Hy. Comns., Commerce Bldg., Milwaukee, grading, concrete paving 37,676 sq.yd. Fairwater-Brandon Rd., State Hy. 44, S.A.P. 2973, to J. D. Bonness, Milwaukee, $55,-070; one course concrete paving 2,079 sq.yd. S.T.H. 41, S.A.P. 2974, to Schwerm Bros., Inc., 50 Lea St., Milwaukee, $6,189. Noted Aug. 8.

Wisconsin—State and Calumet Co. Hy. Comns., Green Bay, grading, concrete paving 111,350 sq.yd. Manitowoc-Appleton Rd., Hy. 10, S.A.P. 3355 and 3359 and F.A.P. 424-C, to Koepke Bros. Constr. Co., Appleton, $170,178; crushed stone surfacing 2.526 mi. County Trunk Z, C.P. 3367, to Schultz Bros., Shawano, $207. Noted Aug. 8.

Wisconsin—State and Brown Co., Hy. Comns., Green Bay, asphalt paving Green Bay-Shawano Rd. and Dick Creek-Shawano Rd., to Schuster Constr. Co., Denmark, $79,180 and $27,006 respectively — Green Bay-Kankana Rd., to Cherney Constr. Co., Francis Creek, $39,939—Mission Rd., to Garnock Constr. Co., Eau Claire, $4,715—South Bway.-Slough Rd. and Green Bay-Sturgeon Bay Rds., to J. Rosmussen & Sons, $8,984 and $63,129. Grand total $222,964. Noted July 31.

Wisconsin—State and Monroe Co. Hy. Comns., La Crosse, concrete paving 4.58 mi. F.A.P. 396-A, to L. G. Arnold Inc., Eau Claire, $77,774; crushed stone surfacing 5.26 mi. S.P. 5290, to F. J. Balmer, Waterloo, $20,000. Noted Aug. 7.

Wis., Milwaukee—City, paving West Center St. and alley between North 2nd and North 3rd Sts., to White Constr. Co., 68 East Wisconsin Ave., $43,173—North 53rd, South 38th St. and 2 alleys, to Gumz & Switalski, 831 13th Ave., $13,892—West Crawford Ave. and 3 streets, to Gerwinski Constr. Co., 816 Clinton St., $27,914—5 streets, to N. Harris, 244 Mason St., $23,-170—West Roosevelt Dr., to R. H. Gumz, 125 Muskego Ave., $4,376—West Trenton Pl., to A. J. Koch, 1297 Cromer St., $8,721—West Bruce St., to Jacobs & Wending, 181 Church St., Wauwatosa, $6,383. Grand total $136,014.

Wis., Wauwatosa — Bd. P. Wks., to A. E. Retzloff, 868 Island Ave., Milwaukee, improving Ravenwood Circle, $10,413; 89th St., $1,242; Glenn Pl., $1,613; Thornapple Parkway, $10,-529; Clarke St., $8,919; Eagle St. $9,149—to Parkinson Constr. Co., 3513 Highland Blvd., Milwaukee, Glencoe Circle, $7,432; 85th St., $2,223; and 60th St., $1,771. Grand total $53,-291. Noted July 24.

Ont., Ottawa — Concrete curbing, guttering, asphalt on concrete paving Argyle Ave. and Thomas St., also approaches to Somerset St. Bridge, to O'Learys Ltd., Rideau St., $63,699.

Constr. News page 86

EXCAVATION, DRAINAGE, IRRIGATION, LEVEES, RIVER AND HARBOR

PROPOSED WORK

Ill., Harrisburg—State Dpt. Purchases & Constr. Div. Waterways, Springfield, soon takes bids straightening 7 mi. Saline River, Saline Co., incl. 1,900,000 cu.yd. excav., near here. H. H. Kohn, dir. Chicago office, 1510 Consumers Bldg., 220 South State St. L. D. Cornish, ch. engr.

Kan., Atchison—Delaware Drainage Dist. 2, surveys flood control on Delaware River, near here. $25,000. E. T. Archer & Co., 609 New England Bldg., Kansas City, Mo., engrs.

Mex., Reynosa—D. Salazar, Reynosa, or Brownsville, Tex., irrigating 100,000 acre tract land, incl. cleaning out canals, constructing canals, installing new machinery. Some of work will be done by day labor. Private plans.

Okla., Altus—Jackson Co. preliminary plans irrigation project, serving 100,000 acres. $75,-000. A. Kindel, secy.

Okla., Cordell—Cavalry Creek D. D. 1 preliminary plans 3.5 mi. ditches. Wood Eng. Co., 610 Perrine Bldg., Oklahoma City, engrs.

Tex., Brownwood—Brown Co. Water Impvt. Dist. 1, soon takes bids irrigation work, earth and concrete dam, involving 750,000 yd. earth and 10,000 yds. concrete, fill or semi-hydraulic construction, covering 700 acre tract of land and provide for 125,000 acre feet water at spillway level, water will be piped to city. $2,500,000. Noted Feb. 20.

BIDS ASKED

Calif., Los Angeles—Sept. 2, by Supervs. Los Angeles Co., double pile and wire revetment with piles spaced 20 ft. center to center in each row, 6,500 lin.ft. double pile and wire revetment with piles spaced 12 ft. center to center in each row, 1,800 lin.ft. additional strip in fencing incl. anchor 2,000 lin.ft.

Calif., Oroville—C. F. Belding, clk. Butte Co., taking bids causeway, fill, in Road Dist. 1.

Illinois—Sept. 5, by Bd. Comrs. Barnett Special Drainage Dist. of Macoupin and Montgomery Counties, at Carlinville Natl. Bank Bldg., Carlinville, grading, grubbing, clearing, restoration, removing, rebuilding culverts, 4 flood gates, 2,000 ft. hedge pulled, 69,360 cu.yd. earth excav. F. S. Morse, dist. engr. Sheppard, Morgan & Schwaab, Faulstich Bldg., Alton, engrs.

Ill., Gorham — Aug. 29, by Bd. Comrs. Big Lake Special Drainage Dist., Jackson Co., at office T. G. Dunn, dist. engr., 18,300 lin.ft. ditchwork, incl. 42,000 cu.yd. earth excav., clearing right-of-way requiring drag line with boom not less than 50 ft.

Ind., Gary — Sept. 2, by Bd. Wks., 5¾ mi. Burns Ditch Extension. $32,000. A. P. Melton, Gary, engr.

Excavation, Drainage, Irrigation, Levees, River and Harbor (Continued)

Ky., Red Mills—Sept. 23, by State Hy. Comn., Frankfort, fill approaches to Nolin River Bridge on Elizabethtown-Hodgenville Rd., S.P. 11-A B, Hardin Co. B. Johnson, chn.

Mich., Detroit—Aug. 22, by H. W. Bush, comr. Dpt. Parks & Blvds., 735 Randolph St., 697 ft. rein.-con. sea wall to have trapezoidal cross section, 5 ft. wide at bottom, 3 ft. on top and 7 ft. high, at Memorial Park. $40,000. P. A. Fellows, city engr.

Okla., Hennessey—Sept. 2, by O. B. Howard, clk. Kingfisher Co., Borelli Drainage Ditch, incl. 200,000 cu.yd. excav. $25,000. C. R. Steele, Kingfisher, engr.

CONTRACTS AWARDED

Calif., San Francisco—Bd. Comrs. Palais Creek Reclamation Dist., rock bulkhead wall in trench at Islais Creek, incl. 325,000 cu.yd. dredging, 475,500 tons rock fill, to Healey-Tibbitts Co., 64 Pine St., $257,615. Noted July 31.

Illinois—Sangamon Outlet Dist., Mason, Menard and Cass Counties, at Havana, 4.5 mi. open ditch work, incl. 688,000 cu.yd. excav., to Gillen Constr. Co., Beardstown.

Ill., Watseka — D.D. 1, Ash Grove Twp., Iroquois Co., 14,410 ft. ditch work, incl. 34,157 cu.yd. excav., to S. W. Hardwick, Rantoul.

Ind., Laporte—Bd. Comrs. Laporte Co., 9.45 mi. Bellinger Ditch, incl. 283,384 sq.yd. excav., to Hixon Bros., Wanatah, $28,187. Noted July 31.

Ind., Laporte—Bd. Comrs. Laporte Co., improving 21.5 mi. Rodman Ditch, incl. 230,663 cu.yd. excav., to E. W. Mattocks, Parr, $24,306. Noted July 31.

Kan., Wichita—Bd. Comrs., Protection and Riverside Drainage Districts, c/o R. C. Foulston, 608 Fourth Natl. Bank Bldg., 11.5 mi. channels in Cowskin Creek; 2.6 mi. in Big Slough; 5.6 mi. Big Slough; to Callahan-Walker Constr. Co., 1200 First Natl. Bank Bldg., Omaha, Neb., $72,516. Noted July 24.

Md., Baltimore—Mayor and City Council, dredging Baltimore Harbor, to Arundel Corp., Pier 4, Pratt St., $52,560.

Mass., Harwich — Commonwealth of Massachusetts, Dpt. P. Wks., State House, Boston, dredging channel 60 ft. wide on bottom, 6 ft. deep at mean low water, Herring River, to Trimount Dredging Co., 10 State St., Boston, $51,640.

Tenn., Memphis—Memphis Harbor Comn., at office K. Markwell, et al., engrs., 1327 Columbian Mutual Tower, 150,000 cu.yd. excav., 600 ft. 36 in. semi-circular drainage pipe, 4,200 ft. drainage pipe leading into drain, to F. S. Neely & Co., Memphis, $81,246.

B. C., New Westminister—N. Desjardins, secy. Dpt. P. Wks., Ottawa, Ont., 5 mi. rock placed by special dump barges, river control jetty at mouth Fraser River, to Coast Quarries Ltd., 837 Hastings St. W., Vancouver, $425,000. Noted July 17.

N. S., Little Anse—N. Desjardins, secy. Dpt. P. Wks., Ottawa, Ont., breakwater, to T. D. Morrison, Descouse, $19,000. Noted June 26.

Ont., Michipicoten—Algoma Central & Hudson Bay Ry. Co., Sault Ste. Marie, R. S. McCormick, ch. engr. and Dpt. P. Wks., Ottawa, dredging harbor, extending 310 ft. present coal dock, to A. B. McLean & Son, Brock St., Sault Ste. Marie. Est. $250,000.

Ont., Oakville—Dpt. P. Wks., Ottawa, dredging, to Russell Constr. Co. Ltd., Harbor Comn. Bldg., Toronto, $9,843.

Ont., Port Stanley—Dpt. P. Wks., Ottawa, retaining wall, to Canadian Dredging Co., Midland, $30,000.

Quebec—N. Desjardins, secy. Dpt. P. Wks., Ottawa, Ont., dredging St. Maurice, to Natl. Dock & Dredging Corp., 23 de Varennes St., Quebec, $22,500.

Public Bond Elections

Coming Bond Elections

Water Distribution System Extension, Etc. — Stratford, Calif., $30,000.

Waterworks—Liberal, Mo., Sept. 9, $40,000.

Well, Tank, Etc. — Richland, Mo., Sept. 4, $50,000.

Reservoir, Filter Plant, Dam, Etc. — Hobart, Okla., $400,000.

Swimming Pool—Kansas City, Mo., November, $25,000.

Memorial Park and Buildings — Kansas City, Mo., November, $500,000.

Power Plant — Paragould, Ark., Sept. 21, $125,000.

School—Convent, La., St. James Parish, Aug. 26., $300,000.

FEDERAL GOVERNMENT

PROPOSED WORK

Mass., New Bedford — DREDGING — U. S. Govt., War Dpt., preliminary plans harbor improvements.

Mo., St. Louis—TURBO GENERATOR SETS—U. S. Eng., 428 Custom House, soon takes bids one 1,000 kw. turbo-generating set and one 100 kw. generating set, direct current and one 1,000 hp. motor.

Tex. Fort Bliss—GARRISON—War Dpt., C. J. Symonds, commanding general, garrison, incl. barracks, stables, gunsheds, warehouse, water storage tanks, officers quarters.

Tex., Galveston—MARINE BIOLOGICAL LABORATORY—U. S. Bureau Fisheries, marine biological laboratory on 25 acre site, near here.

Tex., Randolph—OFFICERS QUARTERS, etc.—A. W. Parker, Q.M., Schertz, revised plans by Phelps & DeWees, Gunter Bldg., San Antonio, bachelor officer's quarters, Jobs 1 and 2, each 2 story, part basement, concrete, hollow tile, stucco, est. $150,000 each, W. E. Simpson, 942 Milam Bldg., San Antonio, engr.; revised plans by R. B. Kelly, 336 Milam Bldg., San Antonio, 1 story, 180 x 280 ft., irregular-shaped, post exchange building, incl. cold storage plant, ets. $60,000, Matthews & Kenan, Smith-Young Tower Bldg., San Antonio, engr. Former bids rejected. Noted July 17.

BIDS ASKED

California—CONCRETE LANDINGS—Sept. 12, by Superintendent Lighthouses, San Francisco, concrete landings, concrete stairways, rein.-con. retaining walls, roadways, concrete rainshed, installing pipe lines, water tanks, hoisting derricks, etc., adv. E. N.-R. Aug. 28.

D. C., Wash. — GENERATOR SETS, etc. — Sept. 6, by A. L. Flint, general purch. agt., Panama Canal, generator and air compressor auxiliary sets, steel flats, tiller rope, insulated cable, resistance wire, etc., Schedule 2584.

D. C., Wash.—DRAGLINE SCRAPER OUTFIT—Sept. 9, by A. L. Flint, genl. purch. agt. Panama Canal, dragline scraper outfit, baggage trucks, cable wire, magnet wire, oil circuit breakers, transformers, Schedule 2583.

D. C., Wash.—STREET SIGNS, etc.—Sept. 8, by A. L. Flint, genl. purch. officer Panama Canal, street signs, pipe fittings, sewer bends, conduit elbows, metal valves, insulated cord for portable electric appliances, fire brick, creosoted Southern Yellow pine or Douglas fir crossties, schedule 2582.

Massachusetts—RIPRAPPING—Sept. 3, by U. S. Eng. Office, Customhouse, Boston, riprapping banks Cape Cod Canal; adv. E. N.-R. Aug. 28.

Mo., St. Louis—PUMP—Sept. 4, by U. S. Eng., 428 Custom House, dredging pump for U. S. Dredge Fort Chartress.

Nev., Hawthorne — PIPING — Spec. 6156 — Sept. 10, by Yards & Docks, Navy Dpt., water supply piping and concealed lawn sprinkling system, at Naval Ammunition Depot. Noted Aug. 21.

N. J., Dover—CANNON POWDER BLENDING BUILDINGS—Con. Q.M., Picatinny Arsenal, taking bids Building T.291; 1 story 30 x 45 ft.; Building T.290, 5 story, 32 x 40 ft., incl. 20 ft. elevator tower; Building T.290 B and C, 3 story, 4 x 7 x 90 ft., all brick, steel, plain founds.

N. Y., Fort Wadsworth—QUARTERS—Sept. 22, at office Con. Q.M., constructing 4 houses for non-commissioned officers quarters, utilities; adv. E. N.-R. Aug. 28.

N. Y., Mineola—QUARTERS—Sept. 18, by Con. Q.M., Mitchel Field, 4 field officers and 38 company officers quarters at Mitchel Field; adv. E. N.-R. Aug. 28.

Wyo., Fort Warren—QUARTERS—Sept. 22, at office Con. Q.M., Fort Francis E. Warren, 4 company offiice quarters, adv. E. N.-R. Aug. 28.

CONTRACTS AWARDED

California—ROADS—Bur. P. Rds., San Francisco, crushed surfacing 4.2 mi. El Dorado Co., to Tiffany, McReynolds & Tiffany, and McDonald & Railing, San Jose, $39,745; 8.58 mi. Sierra Co. to E. B. Bishop, Sacramento, $27,095; grading 2.82 mi. El Dorado Co. to Finnell Co., Sacramento, $112,543; 3.55 mi. and crushed rock surfacing 9.9 mi. Plumas Co. to Isbell Constr. Co., Carson City, Nev., $74,469. Grand total $253,852. Noted June 5 and 27 and July 17.

Calif., San Diego — HANGAR IMPROVEMENTS—Spec. 6147—Yards & Docks, Navy Dpt., improving Hangar Buildings 23 and 24, N.O.B., to M. H. Golden, 404 Calif. Bank Bldg., San Francisco, $33,704.

Calif., San Francisco—WARD BUILDINGS—Con. Q.M., general contract 3 rein.-con., ward buildings, to F. J. Reilly, 6350 Fulton St., $104,432. Noted July 17.

Ill., Beardstown — REVETMENT WORK — U. S. Eng., Custom House, St. Louis, Mo., 3,100 lin.ft. earthwork and 170,000 sq.ft. stone revetment in Illinois River, to Missouri River Contg. Co., 601 Kansas Ave., Topeka, Kan., $34,780. Noted July 31.

Kan., Wichita—ELEVATOR—Treas. Dpt. at office Sup. Archt., Wash., D. C., installing, furnishing elevator at U. S. Post Office, to Otis Elevator Co., 810 18th St. N.W., $33,337.

La., New Orleans—CEMENT—U. S. Eng. 60,000 bbl. cement, Mississippi River, f.o.b. cars Okay Junction, Ark., to Arkansas Portland Cement Co., Oklahoma City, Okla., $115,800.

La., New Orleans—QUARANTINE BUILDINGS—Treas. Dpt. at office Sup. Archt., quarantine station, to Batson-Cook Co., West Point, Ga., $258,800. Noted July 12.

Md., Annapolis—TRACKS, etc.—Spec. 6231—Yards & Docks, Navy Dpt., tracks, improvements at Naval Air Station, to D. F. Tyler Constr. Co., 716 East Charlotte St., Norfolk, Va., $126,265.

Mass., Cape Cod—RIP RAP—U. S. Govt. Superintendent Lighthouses, Chelsea, furnishing, placing 1,700 tons rip rap around foundations Channel Lights, to W. R. Farrell, 57 Long Wharf, Boston, at $5.33 per gross ton. Noted July 24.

Miss., Greenwood—POST OFFICE—Treas. Dpt. at office Sup. Archt., extending, remodeling post office, to Batson-Cook Co., West Point, Ga., $51,000. Noted Aug. 7.

Miss., Vicksburg—LEVEE WORK—U. S. Eng., P.O. Box 667, 860,000 cu.yd. levee work Valewood and Fitler Levees, Mississippi River to Canal Constr. Co., McCall Bldg., Memphis, Tenn., $400,100. Noted July 31.

RAILWAYS

PROPOSED WORK

Md., Baltimore — Pennsylvania R.R., E. B. Temple, Phila., Pa., ch. engr., and Municipal authorities have reached agreement for Pennsylvania R.R. terminal project here. Plans involve electrification of existing terminals, constructing two double track tunnels, and two freight warehouses, rebuilding Calvert St. Station, elimination grade crossings, etc. It is reported that work will not go ahead for at least one year.

BIDS ASKED

Colorado—New Mexico Lumber Co., McPhee, bids about Sept. 1, 12 mi. railroad between McPhee and Terris. $40,000. J. S. Barlow, Wilson Bldg., Dallas, Tex., engr.

CONTRACTS AWARDED

Illinois—A. C. Simons, purch. agt., Chicago Great Western R.R. Co., 403 Grand Central Station, Harrison and Wells Sts., Chicago, 15 locomotives, Type 2-10-4 with 63 in. drivers, f.o.b. Chicago, to Baldwin Locomotive Wks., Eddystone St., Phila., Pa. Est. exceeds $1,000,000. Noted Aug. 7.

Oklahoma—St. Louis-San Francisco R.R. Co., Frisco Bldg., St. Louis, Mo., F. G. Jonah, ch. engr., 3 mi. standard gage railroad extension from Shamrock to Drumright, to Allhands & Davis, Joplin, Mo. Est. $120,000.

SUBWAYS AND TUNNELS

BIDS ASKED

N. Y., New York—Sept. 5, by Bd. Transportation, J. H. Delaney, 250 Hudson St., railroad duct line, Routes 101 and 102, for Independent System City-owned Rapid Transit Railroads, and rein.-con. sewer.

CONTRACTS AWARDED

N. Y., New York—Bd. Transportation, J. H. Delaney, chn., 250 Hudson St., furnishing, installing station and tunnel equipment, to Fischbach & Moore, 226 East 41st St., $223,000.

GRADE CROSSINGS

PROPOSED WORK

Okla., Oklahoma City — Oklahoma Co. preliminary plans 2 span 90 ft. rein.-con. underpass. $55,000. J. F. Frazier, Court House, engr.

DAMS

PROPOSED WORK

Ark., Jasper—See "Power Plants."

CONTRACTS AWARDED

Colo., Denver—See "Waterworks."

PIERS AND WHARVES

CONTRACTS AWARDED

Calif., San Francisco—PIER SHED—California State Bd. Harbor Comrs., rein.-con. pier shed, concrete columns, at Pier 1, to Barry & Hilp, 918 Harrison St., $114,868.

N. J., Weehawken—PIER—Erie R.R. Co., G. S. Fanning, ch. engr., 30 Church St., New York, steel, timber, concrete pier, Hudson River and Pier D, incl. elevator, plumbing, insulation, to Foley Bros., Inc., 117 Liberty St., New York. Est. $25,000 or more. Noted June 19.

Que., Sorel—PIER—Dpt. P. Wks., Ottawa, Ont., constructing Pier and Quay 3, to Cummings & Robertson, 70 Lombard St., Toronto, Ont., $513,170.

AIRPORTS

PROPOSED WORK

Calif., Monterey—See "Schools."

Conn., East Hartford (br. Hartford)—Pratt & Whitney Aircraft Corp., 450 Capitol Ave., Hartford, and Chance Vought Corp., 120 Bway., New York, 2 hangars at United Airport. To exceed $40,000. Austin Co., 120 Bway., New York, engrs.

Massachusetts — Massachusetts Air Terminal & Arena, c/o C. Kenniston, Verne Inn, Norwood, drainage engr., soon takes bids draining airport, Fisher Meadows off Neponset St., in Norwood, Dedham and Canton. Noted Aug. 7.

BIDS RECEIVED

N. Y., Buffalo—Sept. 4, by G. F. Fisk, comr. P. Wks., Municipal Bldg., hangar and administration buildings; installing hangar doors; heating; excavating; concreted platform; concrete ramp and retaining walls; plumbing; drainage; gas fitting; electric wiring; fire alarm system, electric clock and watchmen systems; and automatic Neon wind tee, at Marine Airport, foot Georgia St., adv. E. N.-R. Noted Jan. 2.

Constr. News page 87

Airports **(Continued)**

Pa., Warren—Warren Airways. Inc., F. J. McCoy. Pres., Liberty St. and 3rd Ave., taking bids 1 story, 80 x 100 ft., sheet metal hangar, 18 ft. opening, lighting equipment. West Penn Ave. Private plans.

GRAIN ELEVATORS

PROPOSED WORK

Sask., Dubuc—GRAIN ELEVATOR—Pioneer Elevator Co., 50,000 bu. elevator.

POWER AND LIGHTING

PROPOSED WORK

Minn., Minneapolis—See "Sports and Parks."

BIDS ASKED

Illinois—See "Contracts Awarded."

Miss., Woodville—Sept. 2, by Bd. Aldermen, one voltage regulator. connected to exciters of 5 and 7½ kw., 125 volts. one 100 to 500 g.p.m. pump connected to a.c. motor.

N. Y., Binghamton—Sept. 10, by Commissioner Dpt. Mental Hygiene, State Office Bldg., Albany, new transformers, cables, Binghamton State Hospital; adv. E. N.-R. Aug. 28.

CONTRACTS AWARDED

Illinois—Illinois Power & Light Corp., 231 South La Salle St., Chicago. 35 mi. transmission lines, incl. 16 mi. line from Towanda to Cooksville and lines in Bloomington vicinity, own forces. Private plans.

N. Y., Brooklyn—J. J. Dorman, fire comr., Municipal Bldg., New York, portion underground fire alarm system, Feeder "H" Bushwick-Ridgewood Sect., to Waterbury Cable Co., 101 Classon Ave., $24,590. Noted Aug. 7.

SPORTS AND PARKS

PROPOSED WORK

Mass., Quincy—City, T. J. McGrath, mayor, City Hall, municipal golf course. To exceed $25,000. Engineer not selected.

Minn., Minneapolis — Bd. Park Comrs., City Hall. T. Wirth, engr. and supt., improvements at Lake Harriet, incl. grading, paving 3¼ mi. boulevard, installing electric lighting system. $546,000.

N. J., Newark—Cycle Racing Assn., Inc., J. M. Chapman, mgr., 128 Market St., rein.-con. velodrome, Munn, Maybaum and Tremont Aves. $150,000.

N. J., South River—Bd. Council, W. Allgan, mayor, Boro Hall, concrete, tile swimming pool, David St. $30,000. Engineer not selected.

N. Y., Long Island City—Park Bd. at office Dpt. Parks, Arsenal Bldg., Central Park, New York, rejected bids Aug. 12. improving golf links, Forest Park. Noted Aug. 14 Daily.

CONTRACTS AWARDED

Calif., Los Angeles—City, rein.-con. addition to coliseum, 30,000 seating capacity, Exposition Park, to L. E. Dixon Co., Edwards-Wildey Bldg., $415,500.

Mass., Brookline (br. Boston)—Northeastern University, J. Stevenson, in charge, 316 Huntington Ave., Boston, 1 story, brick, concrete, steel locker building, plain found., Kent St., to W. M. Evatt Co., 38 Chauncy St., Boston. Est. $50,000. Noted Aug. 7 under "Unclassified."

HEATING AND VENTILATING

PROPOSED WORK

Mass., Cambridge—Coolidge, Shepley, Bulfinch & Abbott, archts., Ames Bldg., Boston, soon lets contract, heating and ventilating, electrical work, plumbing in Biological Institution, Oxford St. and Divinity Ave., for Harvard University. A. L. Lowell, pres. Est. exceeds $75,000 each.

BIDS ASKED

N. J., Annandale—Aug. 29, by Dpt. Institutions & Agencies, State Office Bldg., Annex, Trenton, furnishing, installing heating, ventilating units, incl. hot water storage tank, plumbing fixtures, at Annandale Reformatory. $25,000. Division of Architecture & Constr. State Office Bldg. Annex, Trenton, engrs.

CONTRACTS AWARDED

R. I., Providence — Providence Community Fund, P. B. Simonds, 118 North Main St., heating in office building, 102 North Main St., to Smith-Gibbs Co., 20 South Main St.; plumbing, to W. H. Keller, 519 Patters Ave.; electrical work, to Peerless Electric Co., 782 Westminster St. Est. $25,000. Noted July 31 under "Offices."

UNCLASSIFIED

PROPOSED WORK

Kansas and Colorado—GAS PIPE LINE—A. K. Lee, Independence Bldg., Colorado Springs, Colo., surveys 300 mi. 10 in. steel natural gas pipe line from Martin and Stevens Counties, Kan., to Colorado Springs, Colo. $2,500,000.

Mass., Medford (br. Boston)—COMFORT STATION—City, F. Blodgett, in charge, City Hall, 1 story, concrete, brick, comfort station, Medford Sq. $25,000.

Oklahoma—GAS LINE—Belchie & Laskey Co., Ada, 28 mi. 14 in. steel gas pipe line from Ada to Holdenville. $75,000. Private plans.

Constr. News page 88

Tex., Laredo — SMELTING PLANT — H. P. Henderson, 522 5th Ave., New York, and associates, smelting plant, incl. 11 buildings, up to 25 x 200 ft. in size, all steel, brick, tile. $125,000. J. B. Harper, San Diego, Calif., mining engr. F. G. Tobridge, Laredo, and New Castle, England, supervising plans.

BIDS ASKED

N. J., Hillsdale—TUNNELS—Sept. 3, by Dpt. Institutions & Agencies, State Office Bldg., Trenton, tunnels for connecting buildings at Hillsdale State Hospital. $25,000. Div. of Architecture & Constr., State House, Trenton, engrs.

N. Y., Utica—FIRE SPRINKLERS—Sept. 3, by Commissioner Dpt. Mental Hygiene, State Office Bldg., Albany, automatic fire sprinklers, at Utica State Hospital; adv. E. N.-R. Aug. 28.

Pa., Pittsburgh — GRANITE MARKERS — Sept. 2, by R. G. Woodside, controller Allegheny Co., granite markers on Ohio River, Allegheny River and Saw Mill Run Blvds. $37,200. A. E. Griffiths, 519 Smithfield St., engr.

Texas — NATURAL GAS PIPE LINE—See "Contracts Awarded."

CONTRACTS AWARDED

Connecticut—GAS PIPE LINE—Connecticut Electric Serv. Co., Pearl St., Hartford, constructing gas pipe line between Manchester and Rockville, to United Eng. & Constr. Co., 112 North Broad St., Phila., Pa.

Ill., Chicago—HOME—Washington and Jane Smith Home Co., 112th Pl. and Western Ave., general contract 3 story, 200 x 225 ft., brick, to H. B. Barnard, 140 South Dearborn St. Est. $500,000. Noted May 1.

N. J., Hillsdale—COW BARN, etc.—Institutions & Agencies, State Office Bldg., Trenton, cow barn, dairy at State Hospital, to Karno-Smith Co., Broad St. Bank, Trenton, $34,450.

Pa., Phila.—SIDEWALK ELEVATOR, CONCOURSE, etc.—Dpt. City Transit, C. E. Myer, dir., City Hall Annex, sidewalk elevator, underground pedestrian concourse, Broad St. Subway, Contr. 254, to McHugh-Lucas Co., 20 South 15th St.

Texas—NATURAL GAS PIPE LINE—United Gas Co., Beeville, 75 mi. natural gas pipe line, incl. 18 in. pipe line from Refugio to Bee Co. fields and thence north and west to connect with trunk lines, also line running west from Pettus to connect with Magnolia line; 16 in. gas pipe line north of Pettus to connect with Moody-Seagraves line, day labor. $250,000. Private plans.

MATERIALS

BIDS ASKED

OIL ASPHALT, etc. — **Florida** — Sept. 8, by State Road Dpt., Tallahassee **(P. means Project)** 18,480 gal. oil asphalt, summer viscosity, alternate 924 tons slag, crushed stone and crushed gravel f.o.b. cars Hampton, for P. 911 Bradford Co.; 1,800 lin.ft. 18 in. corrugated metal pipe and 4-18 in. couplings, f.o.b. Raiford, for P. 801, in same county; 300,000 gal. oil asphalt, f.o.b. Pensacola, P. 802-A, Okaloosa Co. B. M. Duncan, state hy. engr.

GRAVEL—**Tallulah, La.**—Sept. 2, by Police Jury, gravel for surfacing 40 mi. roads. P. O. Benjamin, Tallulah, engr.

LUMBER, etc.—**Mississippi**—Sept. 9, by State Hy. Comn., Jackson, Old Capitol Bldg., 4 months supply creosoted lumber, piling. C. M. Williamson, dir.

GRAVEL—**Canton, Miss.**—See "Streets and Roads."

LUMBER, etc.—**Pontotoc, Miss.**—Sept. 4, by Bd. Supervs. Pontotoc Co., 200,000 ft. creosoted lumber, 6,000 ft. creosoted piling.

ASPHALT OIL—**New Brunswick, N. J.**—Sept. 2, by Bd. Freeholders Middlesex Co., Court House, 60,000 gal. Grade R.C.O. asphalt oil. W. F. Buchanan, Perth Amboy, co. engr.

SAND—**New York, N. Y.**—Sept. 5, by J. Miller, pres. Manhattan Boro, Municipal Bldg., 15,000 cu.yd. asphalt sand.

GASOLINE, etc.—**Virginia**—Sept. 11, by State Hy. Dpt., Richmond, 1,281,000 gal. gasoline, 78,550 gal. automatic lubrication oil; adv. E. N.-R. Aug. 28.

CONTRACTS AWARDED

DOUGLAS FIR and LONG LEAF YELLOW PINE LUMBER—**Boston, Mass.**—City, Transit Dpt., T. F. Sullivan, comr., 1 Beacon St., Douglas Fir and long leaf yellow pine lumber, to Massachusetts Lime & Cement Co., 398 Portland St., Cambridge. $22,531. Noted July 31.

FRAMES, etc.—**Boston, Mass.**—Supply Dpt., 100,000 lb. frames and covers for water service, to Franklin Machine Co., 44 Cross St., Providence, R. I., at $0.023 per lb.

TAR ASPHALT — **Flemington, N. J.** — Bd. Freeholders Hunterdon Co., 30,000 gal. tar asphalt, to Tar Asphalt Service, New Brunswick, at $0.14 per gal.

MACADAM — **Cleveland, O.** — City, surface mixed macadam in Dist. 3, to Bituminous Constr. Co., Leader Bldg., $63,905.

EQUIPMENT

PROPOSED WORK

SHOVEL—**Hollister, Calif.**—E. Dowdy, clk. San Benito Co., purchasing steam shovel. $8,500.

STEAM TURBINE—**Kansas City, Mo.**—Can Products Refining Co., 608 Brokers Bldg., purchasing 4,000 kw. steam turbine.

BIDS ASKED

TRUCKS—**Beverly Hills, Calif.**—Sept. 10, by B. J. Friminger, city clk., 1 or more 1½ ton or 2 ton motor trucks.

TRUCKS—**Blue Earth, Minn.**—Sept. 3, by G. G. Buscho, aud. Faribault Co. two or three 4-wheel 3½-ton capacity drive motor trucks and pull-type grader.

TRUCK—**Brainerd, Minn.**—Sept. 6, by C. W. Mahlum, aud. Crow Wing Co., one 3½ ton 4 wheel drive truck.

TRUCK—**Breckenridge, Minn.**—Sept. 9, by C. E. Seffens, aud. Wilkin Co., one 4-wheel drive 2 to 3½-ton capacity truck and trailer grader.

TRUCK—**Little Falls, Minn.**—Sept. 3, by L. J. Billstein, aud. Morrison Co., 4-wheel drive truck 3½-ton capacity with dump body, trailer grader.

TRACTOR—**Stillwater, Minn.**—Sept. 2, by J. F. Kilty, aud. Washington Co., motor, push type, 20-30 McCormick-Deering tractor.

TRACTOR, etc.—**Corpus Christi, Tex.**—Sept. 9, by Nueces Co., c/o F. A. Tompkins, aud., one 15-30 McCormick-Deering tractor and 1 Shawnee Centuary road grader with 10 ft. blade and extension.

FOREIGN

Greece, Athens — Greek Government awarded contract rapid sand filter system for new water supply, to Ulen & Co., 120 Bway., New York. Est. $400,000.

Buildings

RESIDENTIAL

BIDS ASKED

Calif., Los Angeles—See "Contracts Awarded."

Calif., Oakland—See "Contracts Awarded."

N. J., South Orange—Morris Mandelbaum Associates, 7 East 42nd St., New York, taking bids separate contracts, two 1, 2, 3 and 4 story, basement, 50 x 200 ft., brick, stucco, plain founds., Irvington Ave., $200,000. Harris & Sohn, 17 Mechanic St., Newark, archts.

N. Y., New York—See "Contracts Awarded."

Pa., Manoa—Suburban Homes, Inc., Juniper and Walnut Sts., taking bids 3 story, basement, 87 x 195 ft., rein.-con., brick steel. $300,000. M. Rosenthall, Real Estate Trust Bldg., Phila., archt.

Pa., Pittsburgh — R. T. McCartney, archt., Magee Bldg., taking revised bids 3 story, basement, 100 x 100 ft., brick, limestone, steel, incl. 20 car garage, Ellsworth and Summerlea Sts., for J. A. Natalo, 427 4th Ave. $150,000. Noted Aug. 21.

Tex., Beeville—J. J. McKinney taking bids 8 story, brick, rein.-con., stone hotel, 50,000 sq.ft. floor space. $350,000. M. G. Simons, Builders Exch. Bldg., San Antonio, archt. Noted Aug. 7.

Wash., Seattle—Sept. 2, by R. C. Reamer, archt., Stimson Bldg., 15 story, basement, 115 x 125 ft., brick, steel hotel, 45th and Brooklyn Sts., for University Community Hotel Corp. $500,000. Noted Feb. 20.

CONTRACTS AWARDED

Calif., Los Angeles—P. Elvad, 6231 Afton Pl., 8 story, basement, Class A rein.-con., South Gramercy St., day labor. $300,000.

Calif., Los Angeles — A. Browne, 525 South Gramercy Pl., 6 story, basement, sub-basement, 72 x 130 ft., concrete, rein.-con., ornamental and wrought iron, Rossmore Ave. between Clinton and Melrose Sts., day labor and sub-contracts under supervision owner and C. H. Kirk, 522 South Western Ave., and A. I. Rouda, 502 Lissner Bldg., assoc. archts. $200,000.

Calif., Oakland—Rockwell & Nelson, 38th and Manila Sts., 6 story, basement, Class A concrete, Merritt Ave. near Cleveland St., segregated contracts under supervision C. Treichel, American Bank Bldg.

Nev., Reno—A. Zetooney, 6 story, basement, brick hotel, to K. E. Parker, 135 South Park St., San Francisco, $155,500. Noted Apr. 10.

N. Y., New York—Ardsley Realty Corp., H. Kaufman, 1860 Bway., 19 story, 100 x 243 ft., Central Park W. and 92nd St., separate contracts. $1,400,000. E. Roth, 1440 Bway., archt.

CLUBS

PROPOSED WORK

Calif., San Francisco — Interests represented by J. W. Cohen, Hotel St. Francis, sketches Class A club. $1,500,000.

Pa., Erie—Y. M. C. A., O. G. Hitchcock, pres., 31 West 10th St., plans by Myers & Johnson, Commerce Bldg., altering and constructing 2 story brick, steel top addition, incl. lobby, kitchen, 31 East 16th St. $375,000.

BIDS ASKED

N. Y., New York — National Bureau Y. M. C. A., 547 Madison Ave., bids about Sept. 5, 10 story, railroad branch Y. M. C. A., 220 East 47th St. $1,000,000. Warren & Wetmore, 16 East 42nd St., archts. Noted June 27.

Ind., Rochester—Sept. 3, by Bd. Comrs. Fulton Co., Boyd Smith Tile Ditch, 1,850 ft. 6 and 15 in. vitr. tile $25,000. W. W. Wilson, Rochester, engr.

Clubs (Continued)

Tenn., Knoxville — Sept. 9, by Baumann & Baumann, archts., Knoxville, club, Gay St., Elks Club. $300,000.

Tex., Dallas—Sept. 9, by Y.M.C.A., c/o W. A. Scott, secy., and E. T. Moore, chn. Building Comn., for Central Y.M.C.A., 12 story, 200 room, brick, steel, rein.-con., stone, Erway and Patterson Sts. $750,000. A. F. Korn, Jr., Thomas Bldg., archt. Noted May 15.

HOSPITALS

PROPOSED WORK

Calif., Los Angeles—Los Angeles Co., plans by K. Muck, county archt., rein.-con., Italian design nurses home. $300,000.

Ky., Louisville—City and Jefferson Co. sketches additions to Waverly Hills Sanitorium, incl. wards for children and colored patients, laundry, power plant, additional fire hydrants, other equipment, at Waverly Hills (suburb). $465,000. Architect not selected.

Minn., St. Paul — Ramsey Co. Bd. Control, C. A. Lindquist, executive secy., 207 Pittsburgh Bldg., nurses home at Ancker Hospital, Jefferson and Colborne Sts. $500,000.

BIDS ASKED

Ill., Princeton—Sept. 3, at office City Clerk, City Hall, 2 story, 36 x 63 ft., brick, tile, rein.-con. addition to Julia Rackley Perry Memorial Hospital, J. C. Larson, 1st State Bank Bldg., hospital secy. Schmidt, Garden & Erikson, 104 South Michigan Ave., Chicago, archts.

Mass., Boston—Boston Floating Hospital, E. Dope, chn., 244 Washington St., taking bids 4 story, basement, brick, steel, plain found., Nassau and Ash Sts. $150,000. Stevens & Lee, 45 Newbury St., archts. Noted June 26.

O., Cleveland—Cleveland Clinic Foundation, G. W. Crite, pres., 2050 East 93rd St., soon lets contract 4 story, basement, 120 x 140 ft., stone, steel, concrete clinic, East 93rd St. $400,000. Ellerbe & Co., 692 Endicott Bldg., St. Paul, Minn., archts.

CONTRACTS AWARDED

Md., Sparrows Point (br. Baltimore)—Bethlehem Steel Co., Sparrows Point, Md. or Bethlehem, Pa., 1 story, basement, irregular shaped, brick hospital, to Triest & Earle, Real Estate Trust Bldg., Phila., Pa. Noted July 31.

Pa., Wernersville — Commission of Pennsylvania, Dpt. Property & Supplies, Harrisburg, B. E. Taylor, secy., general contract 3 story, basement, 22 x 316 ft. and 28 x 53 ft., brick, steel receiving ward building, plain found., to J. D. Ginrod, 10 South 18th St., Phila., $192,367. Heating and ventilating, to C. C. Kollcump & Son, 515 Market St., York, $19,774; electrical work, to R. J. Smith Co., 10 South 18th St., Phila., $7,995.

Ont., London—Watt & Blackwell, archts., 288 Dundas St., general contract 4 story, basement, 40 x 60 ft., and 60 x 350 ft., brick addition, to John Hayman & Sons, 432 Wellington St. Est. $350,000. Noted Aug. 7.

CHURCHES

PROPOSED WORK

Calif., Los Angeles—Beth Thepelo Temple plans by H. Feigenbaun, Union Bank Bldg., brick, steel synagogue, Cincinnati St. To exceed $150,000.

Conn., Hartford—St. Luke's Roman Catholic Church, A. Nilen, bishop, plans by Whiton & McMahon, 805 Main St., 1 story, basement, brick, stone, Eaton St. $150,000. Will construct basement only first.

Mass., Attleboro—St. John's Roman Catholic Parish, T. F. McLean, pastor, 155 North Main St., sketches by Maginnis & Walsh, Statler Bldg., Boston, 1 story, basement, stone, church, $200,000. Noted Feb. 13.

N. J., Dunellen — Holy Innocents Episcopal Church, C. A. Conover, chn., 334 4th St., raising $150,000 funds, 2 story, basement, brick parish hall, plain found.

Mass., Everett—Elm St. Baptist Church, E. V. Laird, pastor, 150 Elm St., soon takes bids 1 story, basement, brick, stone, plain found., Elm St. $150,000. Private plans. Noted Feb. 27.

Mass., Quincy—St. Joseph's Roman Catholic Church, F. Crane, pastor, 556 Washington St., convent, Washington St. $150,000. Architect not selected.

Mo., O'Fallon—St. Marys Institute, Sister Wilhelmenia, superior, soon lets contract 1 and 3 story, basement, 33 x 144 ft. and 57 x 158 ft., rein.-con., brick convent addition. O'Meara & Hills, 1036 Arcade Bldg., St. Louis, archts.

N. J., Fairview — Church of St. John the Baptist, J. E. Kierman, 235 Anderson Ave., 2 story, basement, brick, steel, plain found., Anderson Ave. and Walker St. $150,000. Noted Aug. 21.

Pa., Roxborough (sta. Phila.)—Davis & Dunlap, archts., 1805 Walnut St., Phila., soon lets contract 2½ story, basement, 118 x 125 ft., brick, steel, stone, Green Lane, for 1st Methodist Episcopal Church. F. D. Lawrence, pastor, 476 Green Lane, Phila.

BIDS ASKED

Calif., Los Angeles—See "Contracts Awarded."

Pa., Erie—W. T. Monahan, archt., 805 Palace Hardware Bldg., taking bids (1st unit), incl. 3 story, basement, 30 x 60 ft., brick, hollow tile dormitory, East Lake Rd., for Our Lady of Charity, 205 West 9th St. Total est. $250,000.

CONTRACTS AWARDED

Calif., Los Angeles—Beth Thepelo Temple, R. B. Gardner, rabbi, 1 story, balcony, 86 x 140 ft., brick, steel, Cincinnati St. between Fickett and Mott Sts., day labor, under supervision H. Feigenbaum, 419 Union Bank Bldg. $175,000.

Me., Fort Fairfield—St. Dennis Roman Catholic Church, J. J. Finn, pastor, 1 story, basement, brick, stone, plain found., to L. Malo & Son, 51 East Ave., Lewiston. Est. $150,000. Noted July 24.

N. J., Plainfield—Crescent Avenue Presbyterian Church, general contract 3 story, basement, 85 x 150 ft. and 50 x 65 ft., brick, steel, church, parish house addition, Crescent and Watchung Aves., to Wigton-Abbot Corp., 552 West 23rd St., New York. Est. $150,000. Noted July 17.

N. J., Ridgefield Park—J. S. Piggott, archt., 42 Walnut St., Newark, general contract 1 story, basement, 110 x 155 ft., brick, steel, plain found., to H. Montague & Son, Inc., 15 Exchange Pl., Jersey City, for St. Francis Roman Catholic Church, J. J. Butscher, pastor, 114 Mount Vernon St. Est. $250,000. Noted July 24.

Tenn., Buntyn (br. Memphis)—Buntyn Methodist Church, 3 story, 112 x 155 ft. church, Sunday School, to E. J. Pearson, Fidelity Bank Bldg., $150,000. Noted Feb. 13, under Memphis.

SCHOOLS

PROPOSED WORK

Calif., Monterey—Monterey Union High School Dist. plans by Swartz & Ryland, Spazier Bldg., fireproof academic building, auditorium, gymnasium, flying field, heating plant, fireproof. $275,000.

Conn., West Hartford (br. Hartford)—Town, School Bd., plans by R. F. Barker, 15 Lewis St., Hartford, 2 story, basement, 190 x 290 ft., brick, steel, stone elementary and Junior High School, Park Rd. $500,000.

Ill., Chicago—Armstrong, Furst & Tilton, archts., 11 South La Salle St., soon takes bids 4 story, rein.-con., Indiana limestone, brick, Kimbark Ave. and 59th St., for University of Chicago, 122 South Michigan Ave. $750,000.

Kan., Kansas City—Leavenworth Diocese, Leavenworth, soon lets contract 3 story, basement, rein.-con., brick high school, 18th St. and Barnett Ave. $200,000. Brinkman & Hogan, 513 Citizens Natl. Bank Bldg., Emporia, archts.

Mass., Cambridge—Coolidge, Shepley, Bulfinch & Abbott, archts., Ames Bldg., Boston, soon lets contract 3 units Freshman dormitories, 3 story, basement, 40 x 75 ft., 40 x 136 ft. and 40 x 176 ft., brick, steel, plain found., for Harvard University, A. L. Lowell, Pres. $500,000. Heating and ventilating, plumbing, electrical work, est. exceed $25,000 each.

Mass., Malden (br. Boston)—City, W. A. Hastings, City Hall, elementary school. To exceed $150,000. Architect not selected.

Mass., Wellesley — Wellesley College, E. F. Pendleton, pres., sketches by C. Z. Klauder, 1429 Walnut St., Phila., Pa., zoological laboratory, college grounds. $250,000.

Minn., Minneapolis—Swedish Tabernacle, L. G. Nelson, chn. Bd. Directors, 625 8th Ave. S., plans by Sund & Dunham, 512 Essex Bldg., 3 story, basement, rein.-con., brick, incl. auditorium, 7th St. and 8th Ave. S. $150,000.

Minn., Minneapolis—State Comn., of Finance & Administration, State Capitol, St. Paul, soon lets contract 3 story, basement rein.-con., brick, steel, stone dormitory at State University campus. $300,000. C. H. Johnston, 715-360 Robert St., St. Paul, archt.

Me., Fryeburg—J. C. and J. H. Stevens, archt., 447 Congress St., Portland, soon lets contract 2 story, brick, steel, academy, plain found., for Fryeburg Academy, E. O. LaCasce. $150,000. Noted July 24.

N. J., Fairview—Bd. Educ., O. Kuenzler, pres., Lincoln School, revised plans by R. Cadien, 545 Gorge Rd., Grantwood, Grade and Junior High School, 2 story, basement, Bergen Blvd. $350,000. Noted July 31.

N. J., Piscatawaytown—Bd. Educ., Raritan Twp., plans by A. Merchant, 1 Elm Row, New Brunswick, Piscatawaytown School, 2 story, basement, brick, stone, steel, plain found. $150,000. Noted Aug. 7.

O., Cleveland—Bd. Educ., F. G. Hogen, dir., plans by G. M. Hopkinson, Auditorium Garage Bldg., 3 story, basement, 224 x 416 ft., brick, steel, concrete high school, West 52nd St. and Buddulph Ave. $800,000.

Okla., Oklahoma City—J. G. Stearley, clk. School Bd., rejected bids Aug. 11, William Howard Taft Junior High School, 2 story, 170 x 375 ft., brick, Shartel St., for Bd. Educ. $260,000. Noted July 31.

Pa., McKeesport—Bd. Educ., J. B. Richey, supt., Ariel Bldg., plans by C. R. Moffet, Masonic Temple Bldg., Trade High School. $600,000. Noted Mar. 13.

BIDS ASKED

Calif., Berkeley—University of California bids about Sept. 1, Engineering College, 4 story main building, 40,000 sq.ft. floor space; Hesse Hall, 2 story, 8,000 sq.ft. floor space; 1, 2 and 3 story laboratory, 30,000 sq.ft. floor space, on campus. $685,000. G. W. Kelham, 315 Montgomery St., San Francisco, archt. H. J. Brunnier, Sharon Bldg., San Francisco, engr.

Conn., Stratford—Sept. 4, by J. B. Wright, town mgr., Birdseye St. School for School Bldg. Com.; adv. E. N.-R. Aug. 28.

Conn., West Haven (br. New Haven)—Sept. 15, by City, E. J. Grimes, 18 Smith, 2 story, basement, brick, steel school. $200,000. R. W. Foote, 185 Church St., New Haven, archt. Noted July 24.

Del., Oxford—Lincoln University, c/o Chester Co. School Auxiliary, A. J. Taylor, in charge, Du Pont Bldg., Wilmington, taking bids general contract 3 story, basement, 65 x 125 ft., brick, rein.-con., steel dormitory, plain found. $150,000. Guilbert & Betelle, 20 Branford Pl., Newark, N. J., archts. Noted Aug. 7.

Ind., Lakeville—Sept. 5, by School Comrs., St. Joseph Co., brick, steel high school, incl. auditorium, gymnasium. $150,000. H. Miller, Elkhart, archt.

N. J., Keansburg—V. J. Eck, archt., 12 Broad St., Red Bank, taking bids general contract 2 story, basement, brick, steel, plain found., Carr Ave., for St. Anne's Roman Catholic School. $150,000. Noted Aug. 7.

N. J., Trenton Junction—Sept. 9, by State Bd. Educ., Trenton, 2 story, 103 x 148 ft., concrete library and recitation building, Lake Blvd. Guilbert & Betelle, 20 Branford Pl., Newark, archts.

N. Y., Buffalo—Sept. 4, by Bd. Educ., altering and constructing addition to School 64, incl. auditorium, gymnasium, cafeteria, showers and boiler room, Amherst St. and Park Lake Ave. $438,000. D. McNeill, Genesee Bldg., archt. Noted July 10.

N. Y., South Jamaica—Sept. 3, by W. C. Martin, archt. and supt. School Buildings, Flatbush Ave. extension and Concord St., Brooklyn, general contract, P.S. 123, 119th Ave. from 145th to Inwood Sts., for Bd. Educ., 500 Park Ave., New York.

O., Alliance—Sept. 5, by Bd. Educ., H. Woolf, clk., 2 story, basement, 120 x 137 ft., concrete, brick high school, incl. auditorium, gymnasium, chemical laboratories. $185,000. Fox, Duthie & Foose, Union Trust Bldg., Cleveland, archts. Roller & Simboli, Alliance, assoc. archts. Noted July 24.

O., Lucas—Richland Co. School Bd., Mansfield, bids about Sept. 18, 2 story, basement, brick, steel, high school. $150,000. C. J. Marr, New Philadelphia, archt.

CONTRACTS AWARDED

Calif., Claremont—W. T. Johnson, archt., San Diego Trust & Savings Bank Bldg., San Diego, Class A rein.-con. auditorium, to Wurster Constr. Co., Architects Bldg., Los Angeles, for Claremont College. $480,000. Noted July 24.

Calif., Los Angeles—Urban Military Academy, 637 North Wilcox Ave., 2 story, 112 x 136 ft. dormitory and administration building, 2 story, 85 x 100 ft. classroom, 1 story 50 x 90 ft. gymnasium, frame, stucco, tile, brick, wrought iron, at Westwood Hills, Beverly Blvd. and Layton Dr., to A. B. Weber, Union Insurance Bldg., $150,000. This corrects report in Aug. 7 issue.

Conn., Lakeville—Hotchkiss School, Salisbury, brick, stone chapel, dormitory units for school, to Jas. Stewart & Co., Inc., 230 Park Ave., New York. Noted Aug. 15.

Conn., New Haven—Bd. Trustees Yale University, general contract 2 quadrangular 175 x 442 x 575 ft., brick, steel, cut stone dormitories, to Marc Eidlitz & Son, 41 East 42nd St., New York; excavation, to C. W. Blakeslee & Sons, 58 Waverly St. Total est. $2,500,000.

Ill., Urbana—University of Illinois general contract 4 story, mezzanine, 85 ft. 10 in. x 217 ft. 2 in. woman's gymnasium, steel, wall bearing frame, to H. G. Whittenberg, 604 West Jefferson St., Louisville, Ky., $226,000; heating and plumbing, to Johnson Bros., Champaign, $31,094. Noted May 8.

Mass., Dorchester (sta. Boston) — City of Boston, Wm. Bradford School, 2 story, basement, brick, limestone, plain found., to John Bowen Co., 129 Newbury St., Boston. Est. $150,000.

Mass., Lowell—Notre Dame Roman Catholic Church, c/o W. F. Fontaine, archt., 285 Main St., Woonsocket, R. I., 2 story, basement, brick, stone, plain found., Smith Ave. and Middlesex St., to L. Marion, 12 Martin St. Est. $150,000-$160,000. Noted June 19.

N. H., Berlin—City, W. R. Brown, chn., altering and constructing 3 and 1 story, basement, brick, steel high school addition, and gymnasium, plain found., to Louckes & Clark, 6 Ernest St., Wallingford, Conn. Est. $150,000. Noted Aug. 7.

N. Y., Buffalo—Bd. Educ., Genesee Bldg., general contract altering and constructing addition to School 19, to Tifft Constr. Co., Iroquois Bldg., $192,000; heating, to E. J. Leary, 208 Oak St., $58,685. Noted May 15.

N. Y., Arrochar—DePace & Juster, archts., 151 West 46th St., New York, general contract 2 story, basement, 50 x 120 ft. school, dormitory, to J. Comacchia, 1171 Herkimer St., Brooklyn, for Sisters of St. John Baptist, Cleveland Pl., St. George. Est. $150,000. Noted Aug. 7.

Pennsylvania—Bd. Educ. Foster Twp., E. C. McIntosh, secy., Derrick City, general contract 1 story, part basement, 88 x 127 ft., concrete, Indiana limestone, brick, hollow tile, steel, at Sawyer City, also brick, Indiana limestone, hollow tile, steel, concrete school at Tuna, both McKean Co., to Warren Constr. Co., Gokey Bldg., Jamestown, N. Y., $84,270.

Pa., College Hill (mail Beaver Falls)—W. G. Eckles, archt., 223 East Washington St., New Castle, general contract 1 story, basement, sandstone, hollow tile, steel, concrete library, to Cook Anderson Co., 5th and Insurance Sts., Beaver; heating, to W. M. Clark Co., 19 Lawrence St., New Castle; plumbing, to E. James, College Hill (mail Beaver Falls); wiring, to Industrial Electric Co., 928 3rd Ave., New Brighton, for Geneva College, M. Pearce, pres. Est. $150,000. Noted Aug. 21.

Constr. News page 89

Schools (Continued)

Que., Montreal—Ecole Polythecheqie. St. Dennis St., 44 x 159 ft. addition, Sanguinet St., to G. Archambault. 1584 Clarke St., $157,000.

THEATRES

PROPOSED WORK

Calif., Stockton—National Theatres Syndicate, Inc., 25 Taylor St., San Francisco, plans by Bliss & Fairweather, Balboa Bldg., San Francisco. Class A theatre, North Sutter St. $175,000.

Kan., Hutchinson — Rorabaugh-Wiley Co., Rorabaugh-Wiley Bldg., owners, and Fox West Coast Theatres, c/o M. B. Shanberg, 610 Midland Bldg., Kansas City, Mo., soon lets contract lessee, 2 story, basement, 72 x 165 ft., L shaped, rein.-con., brick, terra cotta, East 1st Ave. near Main St. Mann & Co., 721 Rorabaugh-Wiley Bldg., and Boller Bros., 114 West 10th St., Kansas City, Mo., assoc. archts. Noted July 17.

Okla., Enid—Owner, c/o G. E. V. Blumenauer, archt., 233 Masonic Bldg., sketches 17 story, basement, 125 x 200 ft., rein.-con., brick, stone theatre and commercial building. $780,000.

Okla., Oklahoma City—Publix Theatres, 323 West 6th St., Los Angeles, Calif., sketches theatre, Walker St. $1,000,000. P. McGee, secy.

BIDS ASKED

La., Fayette—Sept. 2, by H. J. Duncan, archt., Alexandria. 1 story, mezzanine, balcony, 1,200 seating capacity, rein.-con, brick, steel, modern equipment, for Southern Amusement Co., Lake Charles.

CONTRACTS AWARDED

Calif., Los Angeles—S. C. Lee & S. T. Norton, archts., Financial Center Bldg., rein.-con., steel, to Sumner Sollitt Co., 810 West 6th St., $250,000. Noted July 24.

BANKS

PROPOSED WORK

Calif., San Francisco—San Francisco Bank, 526 California St., sketches Class A bank and office building, California St. $150,000 or more. Architect not selected.

BIDS ASKED

Vt., Burlington—Chittendon County Trust Co., E. J. Booth, pres., 114 Church St., taking bids 2 story, basement, brick, stone, marble, concrete, steel, plain found., College St. $200,000. Harper & West, 92 State St., Boston, Mass., archts. Noted July 31.

CONTRACTS AWARDED

Calif., Los Angeles—Bank of Italy, Bank of Italy Bldg., rein.-con., steel addition, incl. office, Montgomery and Clay Sts., to K. E. Parker, 135 South Park St., $250,000.

Mass., Brookline—Boulevard Trust Co., R. H. Potter, pres., 1 story, basement, brick, concrete, stone, steel, plain found., to L. W. Oakes, Inc., 100 Hallack St., Boston. $150,000 or more. Noted July 31.

N. J., Passaic—Halsey, McCormick & Helmer, archts., 286 5th Ave., New York, general contract 8 story, basement, brick, steel, incl. offices, plain found., to John W. Ferguson Co., 152 Market St., Paterson, for Peoples Bank & Trust Co. and Hobart Trust Co., 587 Main Ave. Est. $350,000. Noted July 31.

OFFICES

PROPOSED WORK

Calif., Los Angeles—Corday & Broder, c/o C. F. Whittlesay, 618 South Western Ave., archt., 13 story, basement, 90 x 90 ft., rein.-con., Vermont and DeLonge Sts. $600,000 or more.

Calif., Los Angeles—R. E. Taylor, et al, c/o S. C. Lee, Petroleum Securities Bldg., 8 story, basement, 70 x 150 ft., rein.-con., incl. stores, Wilshire Blvd. and Vicente St.

Calif., Los Angeles—C. C. C. Tatum Building Income Trust Co., Fidelity Bldg., 12 story, basement, 120 x 165 ft., rein.-con., steel, incl. garages, 2nd and Hill Sts. To exceed $250,000. Private plans.

Calif., Los Angeles—T. Pittman, c/o S. C. Lee, archt., Petroleum Bldg., 2 story, basement, 140 x 160 ft., brick, steel, incl. stores, Washington and Rimpau Sts. $150,000.

N. J., East Orange—Baldwin Constr. Co., 814 Central Ave., 2 story, basement, brick, steel addition, incl. stores, plain found., 578 Central Ave. $150,000. Warren & Warren, 31 Clinton St., Newark, probable archts. **Maturity indefinite.**

Okla., Bartlesville—Indian Territory Illuminating Oil Co., H. V. Foster, pres., plans by Keene & Simpson, 1005 Land Bank Bldg., Kansas City, Mo., office, 1st St. $500,000.

CONTRACTS AWARDED

Pa., Phila. — McIlvaine & Roberts, archts., Otis Bldg., 33 story, basement, 48 x 78 ft., and 37 x 48 ft., rein.-con., brick, steel, plain found., Lattimer and 17th Sts., to G. A. Fuller Co., Morris Bldg. ●

Wash., Yakima—A. E. Larson, Yakima, 11 story, basement, rein.-con., steel to Hans Pederson Constr. Co., Seattle. $457,300.

Constr. News page 90

STORES

PROPOSED WORK

N. J., East Orange — Starret & Van Vleck, archts., 393 7th Ave., New York, soon lets contract, 4 story, basement, 100 x 110 ft., brick, steel, rein.-con. department store, Main and Prospect Sts., for R. H. Muir, 546 Main St. $150,000.

BIDS ASKED

O., Cleveland—Aug. 28, by Graham, Anderson, Probst & White, archts., Railway Exch. Bldg., Chicago, Ill., 12 story, basement, 109 x 387 ft., concrete, brick, steel, stone department store, 2030 Ontario St., for Cleveland Terminals Building Co., R. Sharp, genl. mgr., Terminal Tower. $9,500,000. Noted July 31.

PUBLIC

PROPOSED WORK

Mass., Fall River—FIRE STATION—City, E. F. Harrington, City Hall, sketches by E. M. Corbett, 167 Bedford St., 2 story brick, Bedford and Troy Sts. $150,000.

Pa., Pottsville—COURT HOUSE—Bd. Comrs. Schuylkill Co. plans by Eric, Fisher & Wood, Hardy and Hayes Bldg., Pittsburgh, 3 story, basement, 84 x 106 ft. and 24 x 50 ft., sandstone, steel addition. $400,000.

BIDS ASKED

Mass., Braintree—FIRE and POLICE STATION—Sept. 3, by C. G. Loring, archt., 7 Water St., Boston, 2 story, basement, 65 x 100 ft., brick, steel, cast stone, central fire and police station, Washington and Union Sts., for Town H. R. Drinkwater, chn. building com. $150,000. Noted Aug. 15.

Mass., Needham — POLICE and FIRE STATION — Town, Bd. Selectmen, taking bids 2 story, basement, brick, stone, concrete, steel plain found., School and Chestnut Sts. $150,000. G. E. Robinson, 80 Federal St., Boston, archt.

N. J., Maplewood (br. South Orange) — POLICE HEADQUARTERS — Police Dpt., E. R. Arculiarsius, ch. clk., Municipal Bldg., bids about Oct. 1, general contract 2 story, basement, brick, steel, plain found. $150,000. C. W. Grant, 175 5th Ave., New York, archt. Noted Aug. 7.

N. J., North Caldwell (mail Caldwell) — PENITENTIARY—Sept. 5, by Bd. Freeholders, Essex Co., Hall of Records Bldg., Newark, general contract altering 4 story, basement, brick, steel, plain found. $150,000. C. W. Wands, 309 Bloomfield Ave., archt. Runyon & Carey, 31 Fulton St., Newark, engr.

N. J., Trenton—LIBRARY RECITATION—Sept. 9, by State Bd. Educ., State House Annex, general contract 2 story, basement, 105 x 150 ft., brick, steel, Ewingville Lake Blvd. between Lawrenceville and Pennington Rds. $150,000. Guilbert & Betelle, 20 Branford Pl., Newark, archts.

CONTRACTS AWARDED

Ind., Gas City—CITY HALL—City, general contract brick, rein.-con., to F. Sypolt, 215 West 4th St., Marion. Est. $150,000. Noted Apr. 24.

BUILDINGS—UNCLASSIFIED

PROPOSED WORK

Calif., Compton—MAUSOLEUM—Knoll Crest Mausoleum Assn., Chapman Bldg., plans 45 x 215 ft, rein.-con. $750,000.

Calif., Los Angeles—LABORATORY—Brunswick Drug Co., 501 North Main St., plans by A. C. Martin, Higgins Bldg., 5 story, basement, 100 x 150 ft., concrete, brick, steel, 2nd St.

Mass., Foxboro—HOME—Doolittle Home, C. Conklin, pres., Bway., sketches by Hutchins & French, 11 Beacon St., Boston, brick, stone home for aged, plain found. $150,000.

N. J., East Orange—EXCHANGE—Voorhees, Gmelin & Walker, archts., 101 Park Ave., New York, soon lets general contract 3 story, basement, 105 x 195 ft., brick, steel, plain found., William and Baldwin Sts., for New Jersey Bell Telephone Co., 540 Broad St., Newark. $150,000. Noted May 1.

N. J., South Orange — EXCHANGE — New Jersey Telephone Co., 540 Broad St., Newark, sketches by Voorhees, Gmelin & Walker, 101 Park Ave., New York, 2 story, basement, brick, steel, plain found., 169-171 South Orange Ave. $150,000.

BIDS ASKED

Ind., Indianapolis—EXCHANGE—Indiana Bell Telephone Co., 256 North Meridian St., bids about January, 8 story, basement, 100 x 200 ft., rein.-con., stone, New York and Meridian Sts. $1,000,000. Vonnegut-Bohn & Mueller, 610 Indiana Trust Bldg., archts. Noted July 3.

N. J., Paterson — HOME — Lee & Hewitt, archts., 152 Market St. bids about Oct. 1, general and separate contracts 2 story, basement, brick, steel addition, plain found., for St. Francis Home, 25 Jackson St. $150,000. Noted Aug. 8.

CONTRACTS AWARDED

N. J., Summit — EXCHANGE — Voorhees, Gmelin & Walker, archts., 101 Park Ave., New York, general contract 2 story, basement, irregular sized, brick, steel, plain found., to Deakman-Wells Co., 921 Bergen Ave., Jersey City, for New Jersey Bell Telephone Co., 540 Broad St., Newark. Est. $150,000.

N. Y., Buffalo—MARKET—Erie R.R. Co., G. S. Fanning, ch. engr., 50 Church St., New York, and New York, Chicago & St. Louis R.R., A. C. Harvey, ch. engr., Terminal Tower, Cleveland, O., four 70 x 264 ft., and one 82 x 100 ft. buildings, fireproof, Clinton St. and Bailey Ave., also paving streets, to J. W. Cowper, Inc., Niagara Sq. Est. $1,000,000.

Buildings

FACTORIES AND MILLS

PROPOSED WORK

Ala., Anniston—BOTTLING PLANT, etc.—Alabama Coca-Colo Bottling Co., soon lets contract 2 story, basement, 71 x 130 ft., rein.-con., brick, bottling plant, garage. $75,000. Pringle & Smith, Norris Bldg., Atlanta, Ga., archts. Noted May 8.

Calif., Santa Cruz — STORAGE and ICE PLANT — Coast Ice & Coal Storage Co., E. E. Huddleson, pres., sketches rein.-con. $40,000 or more.

Ky., Louisville—See "Hospitals."

Mass., Malden (br. Boston)—FACTORY—Malden Ice Cream Co., 84 Exchange St., soon takes bids altering 1 and 2 story, basement, brick, concrete, concrete found., Exchange St. $40,000. A. W. K. Billings, 80 Boylston St., Boston, archt. Noted July 31.

N. J., Camden—FACTORY—Campbell Soup Co., c/o Continental Can Co., 1 Pershing Sq., New York, plans by Francisco & Jacobus, engrs. and archts., 511 5th Ave., New York, 5 story, basement, 130 x 340 ft., brick, rein.-con., plain found., Arch St. $150,000.

Mo., North Kansas City (br. Kansas City)—PLANT—Corn Products Refining Co., brick storage unit addition. $250,000. Private plans.

N. J., Paterson—FACTORY—Lee & Hewitt, archts., 152 Market St., bids about Sept. 15, general contract 2 story, basement, 65 x 165 ft., brick, steel, plain found., for J. S. Royal, c/o architects. $40,000.

O., Youngstown — FACTORY — Anson Aero Mfg. Co., Youngstown, 1 story, brick, concrete, steel general airplane factory, Meridan Rd. $100,000.

Okla., Enid—PRINTING PLANT—Owner, c/o G. E. V. Blaumenauer, archt., 233 Masonic Bldg., deferred construction until 1931, 2 story, basement, brick, limestone, terra cotta plant. $75,000. Noted Feb. 20.

Ont., Hamilton—PRINTING PLANT—Reid Press Ltd., 25 McNab St. S., new printing plant, Ferguson Ave. $150,000. Architect not selected.

CONTRACTS AWARDED

Calif., Petaluma—STORAGE and ICE PLANT—Petaluma Ice & Cold Storage Co., 1 story, brick, 40 ton capacity, to Gay Eng. Corp., 2650 Santa Fe St., Los Angeles, $42,500.

Calif., South San Francisco — FACTORY — Seattle Chain Mfg. Co., 6921 East Marginal Way, Seattle, Wash., 1 story, brick, steel, to Austin Co. of California, Ray Bldg., Oakland, to exceed $40,000.

Conn., Hartford—FACTORY—Terry Steam Turbine Co., Windsor St., altering and constructing 2 story, brick, steel addition, to Bartlett Brainard Co., 252 Asylum St. Est. $40,000, incl. equipment.

Conn., West Haven (br. New Haven)—FACTORY—Connecticut Drug & Perfume Co., 108 State St., New Haven, 4 story, 50 x 200 ft., brick, timber, to Fusco & Amatrude, 59 Amity Rd., New Haven. Est. $160,000. Noted June 12.

Ill., Chicago—FACTORY—Illinois Steel Co., South Chicago, 1 story, 149 x 1,674 ft., brick, rear of 8345-61 Mackinaw St. $1,500,000. Owner builds.

Ind., Evansville—FACTORY—Metal Process Co., general contract brick, steel, to M. J. Hoffman Constr. Co., 403 Furn. Bldg. Est. $250,000.

Ind., Huntington — PLANT — Huntington Laboratories, Inc., general contract brick, steel, to N. Scheer & Son, 508 North La Fountaine St. Est. $45,000. Noted June 5.

Ind., Indianapolis — FACTORY — Erbick Products Co., 1120 East 32nd St., general contract brick, steel, 32nd St. and Monon R.R., to J. Westfall, Indianapolis. Est. $41,000.

Me., Van Buren—MILL—E. LaCroix, rebuilding 1 story lumber mill. $40,000 or more. Owner builds. Private plans.

Mass., Everett (br. Boston)—FACTORY and COKE PLANT—New England Fuel & Transportation, 201 Rover St., brick, steel, concrete, to Koppers Constr. Co., c/o owner, $58,500.

Mass., Jamaica Plain—MANUFACTURING—R. C. A. Victor Co. of Massachusetts, 76 Atherton St., altering 4 story, 60 x 242 ft., brick, steel, plain found., Atherton St., to Turner Constr. Co., 137 Newbury St., Boston.

Mass., Watertown—CLEANSING PLANT—Lewandos, 1 Galen St., 3 story, basement, 90 x 120 ft., brick, concrete, steel, incl. office, plain found., Galen and Pleasant Sts., to W. H. Iliffe, 93 North Beacon St. Est. $160,000.

Minn., Coleraine—ORE WASHING PLANT—Cleveland Cliffs Mining Co., Coleraine, Minn., and Ishpeming, Mich., foundation for 100 x 200 ft., to E. W. Coons Co., Hibbing; steel frame and erection, to Worden-Allen Co., 302 Builders Exch., Duluth. Est. $200,000.

Mo., St. Louis—DAIRY—Pavely Dairy Co., 1001 South Grand Blvd., 1 story, 134 x 300 ft. brick, rein.-con. garage, La Salle Ave. west of Motard Ave., to Fruin-Colnon Contg. Co., 501 Merchants La Clede Bldg. Est. $100,000.

Factories and Mills (Continued)

N. J., Linden—FACTORY—Warren & Wetmore, archts., 16 East 44th St., New York, general contract 1 story, basement, 142 x 225 ft., steel, to Austin Co., 120 Bway., New York, for J. F. Norman, Inc., 400 Madison Ave., New York. Est. $100,000. Noted Aug. 14.

N. J., Newark—LAUNDRY—Alfro American Realty Corp., 72 Whitney St., general contract 1 story, basement, brick, plain found., to I. S. Williams, 72 Whitney St. Est. $40,000. Noted Aug. 21.

N. J., Plainfield—LAUNDRY—M. Beller, c/o W. P. Dyer archt., 412 West Front St., general contract 2 story, basement, 50 x 125 ft., brick, steel, concrete addition, plain found., 415 Madison Ave., to T. Zeller, 45 Summitt Ave., North Plainfield. Est. $40,000.

O., Willoughby — FACTORY — Ohio Rubber Co., for Building C, 1 story, 120 x 400 ft., brick, steel, to George A. Rutherford Co., 2725 Prospect Ave., Cleveland. Est. $200,000. Former contract rescinded. Noted Aug. 7 under "Contracts Awarded."

Pa., Johnstown—STOCK HOUSES—Bethlehem Steel Corp., Bethlehem, 2 double hopper scale cars, at 5 and 6 blast furnace. $600,000. Owner and A. G. McKee Co., engrs., 2422 Euclid Ave., Cleveland, O., build.

GARAGES

PROPOSED WORK

Calif., San Francisco—Owner, c/o L. Ebbets, Call Bldg., 2 story, rein.-con. auto assembly plant, Mission Dist. $100,000.

BIDS ASKED

Mass., Cambridge—Amer. Oil Co. of Massachusetts, 465 Rindge Ave., taking bids 1 story, basement, irregular sized, brick, rein.-con. steel garage, super service station, 104 Mt. Auburn St. $60,000. Fay, Spofford & Thorndike, 44 School St., Boston, engrs. Noted Aug. 7.

N. J., Newark—Elin Auto Supply Co., 273 Halsey St., bids about Sept. 2, general contract 1 story, basement, 45 x 110 ft. and 2 story, basement, 45 x 80 ft., brick, steel auto laundry plant and service station, plain founds., William St., between Washington and Halsey Sts. $40,000. G. Goldberg, 164 Montague St., Brooklyn, N. Y., archt. Noted Aug. 8 under "Bids Asked."

CONTRACTS AWARDED

Ind., East Chicago—Van Senus Bros., Hammond, general contract brick, steel super service station, Hohman and Standard Aves., to J. F. Rahn, 150th St. Est. $40,000.

Mass., Boston—Boston Elevated Ry. Co., Park Sq. Bldg., 1 story, brick, concrete, steel bus garage, concrete found., Washington and Bartlett Sts., to J. Slotnick Co., 199 Washington St. Est. exceeds $40,000.

Mass., Brighton (br. Boston)—Commonwealth Garage, 100 Brighton Ave., 1 story, brick, steel, service station, repair shop, to L. Martiniello & Sons, 49 Dighton St. Est. $40,000. Former contract rescinded. Noted July 31 under "Contracts Awarded."

Mo., Jefferson City—State Hy. Comn., c/o T. H. Cutler, ch. engr., rein.-con., brick garage, file storage building, to McCarthy Bros. Constr. Co., Watson St., St. Louis. $126,790; driving steel pipe piling, to M. E. Gillioz, Monett, $10,000; state furnishes pipe $15,000. Noted July 10.

SHOPS AND FOUNDRIES

PROPOSED WORK

Ont., Hamilton — MACHINE SHOP — Canada Iron Foundries, Queen St., W. A. Hastings, mgr., rebuilding machine and pattern making shops, incl. equipment, recently destroyed by fire, $100,000 loss.

BIDS ASKED

Mass., Springfield—REPAIR SHOP, etc.—City, Superintendent Streets, City Hall, taking bids 1 story, brick, concrete repair shop and storage, plain found., Taylor St. $50,000. McClintock & Craig, 458 Bridge St., archts. Noted July 31.

Mo., St. Louis—SHOPS—Sept. 3, by Bd. Educ., 911 Locust St., 4 story, basement, 101 x 150 ft., rein.-con., brick, stone, shops building, $245,000; also constructing new palm greenhouse, incl. passages into boiler room, resetting boilers, $20,000. G. W. Sanger, acting comr. buildings.

CONTRACTS AWARDED

Ind., Indianapolis—SHOPS—F. G. Tucker & Co., 215 Peoples Bank Bldg., Indianapolis, brick, steel machine shop and service station, East Washington St. and Hawthorne Lane. $40,000. Owner builds.

Ind., Lafayette — MACHINE SHOP — Shell Corp., general contract brick, steel machine shop and service station, 4th and South Sts., to G. Dahn, 319 North 26th St. Est. $42,000.

Pa., Pittsburgh—SHOPS—National Valve & Mfg. Co., H. Haller, Pres., 3101 Liberty Ave., 1 story, 48 x 100 ft., brick, steel addition, 3100 Liberty Ave., to R. E. Harris, Clark Bldg.

POWER PLANTS

PROPOSED WORK

Ark., Jasper—Ozark Reduction Co., c/o G. N. Peavy, Little Rock, power plant and dam 105 ft. high forming lake 10 mi. square on Jasper River at Carver, 10 mi. east of here. $1,000,000. F. E. Hatch, Carver, consult. engr.

Calif., Monterey—See "Schools."

Kan., Leavenworth—St. Marys Academy soon takes bids 1 story, 155 ft. high, rein.-con. brick boiler house. M. Carroll, 713 Linwood Bldg., Kansas City, Mo., archt.

Mass., Boston—City, Institutions Dpt., altering 1 story power house at Long Island Hospital. $50,000.

Okla., Vinita — City sketches light plant. $100,000. F. C. Cowell, Vinita, engr.

Pa., Ford City—City, A. B. Mahoney, city clk., City Hall, preliminary surveys light and power plant. Burns & McDonnell Eng. Co., Interstate Bldg., Kansas City, Mo., consult. engrs.

BIDS ASKED

Calif., Pasadena—Sept. 4, by City Directors, furnishing, installing boiler for power plant. Former contract rescinded.

Ore., Hood River — Sept. 2, at office H. L. Howe, city recdr., power house at Wilson St. Reservoir; electrical distribution system, overhead pole and wiring system; 145 street lights and wiring and trenching for 2 ornamental lighting systems. Stevens & Koon, Spaulding Bldg., Portland, engrs.

Colo., Colorado Springs—City Council, E. Mosely, mgr., power plant, about Sept. 1, light and power plant office. $90,000. T. D. Hetherington, Independence Bldg., archt. J. W. McCullough, Insurance Bldg., Denver, consult. engr.

N. J., Jersey City—Sept. 15, by State Hy. Dpt., Trenton, equipment for transformer house, Route 10, Sect. A, Contr. 40, Newark Turnpike Bridge, Hackensack River, Hudson Co. A. L. Grover, ch. clk.; adv. E. N.-R. Aug. 28.

CONTRACTS AWARDED

Conn., New London—Connecticut College for Women, Mohegan Ave., 1 story, 45 x 70 ft., brick, steel, concrete boiler building, Mohegan Ave. to John Mondelci & Co., 225 Coleman St. Est. $41,500.

Mass., Everett—Mystic Iron Wks., 250 Stuart St., Boston, altering and constructing 1 story, brick, steel boiler house addition, plain found., Dexter St., to Koppers Constr. Co., Kopper Bldg., Pittsburgh, Pa. Est. $40,000. Noted Aug. 7 under "Contracts Awarded."

Ontario — Ontario Power Serv. Corp., subsidiary Abitibi Power & Paper Co., Northern Ontario Bldg., Toronto, hydro power development, Abitibi Canyon, 64 mi. north of Cochrane, to Dominion Constr. Co., Reford Bldg., Toronto, $20,000,000. Noted May 20.

WAREHOUSES

PROPOSED WORK

Ill., Carbondale—Kroger Grocery & Baking Co., 7th and Walnut Sts., Cincinnati, O., soon lets contract 1 and 2 story, 250 x 300 ft., rein.-con., brick. $125,000. E. H. Niemann, 3816 Shaw Ave., St. Louis, Mo., archt.

BIDS ASKED

Calif., Los Angeles—Morgan, Walls & Clements, archts., Van Nuys Bldg., taking bids 5 story, basement, 50 x 100 ft., rein.-con., Banning St., for Los Angeles Soap Co., 617 East 1st St.

N. J., Passaic—J. Finkelstein, 165 Lafayette Ave., taking bids general contract 1 story, basement, 100 x 120 ft., brick, rein.-con., steel, plain found., Exchange Pl. $150,000. H. Gerritsen, 118 Passaic Ave., Garfield, archt.

Pa., Phila.—Sept. 4, by T. J. Skillman, ch. engr. Pennsylvania R.R. Co., Broad St. Sta., 16th and Arch Sts., 5 story, 200 x 388 ft. cattle storage, rein.-con., brick, caisson found., 36th St. and Grays Ferry Rd. $800,000. W. H. Cookman, Broad St. Sta., archt.

CONTRACTS AWARDED

Mass., Malden (br. Boston)—National Biscuit Co., 129 Franklin St., Cambridge, 1 story, brick, steel distributing station, 10,000 sq.ft. floor space, plain found., Oak Grove Dist., to John MacDonald Constr. Co., 250 Stuart St., Boston. Est. $40,000.

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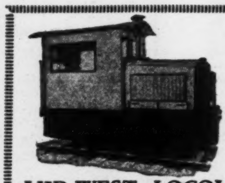

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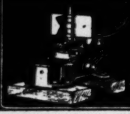

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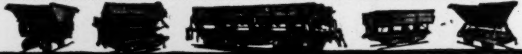

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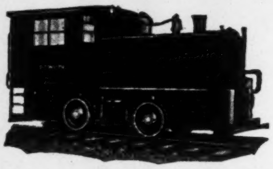

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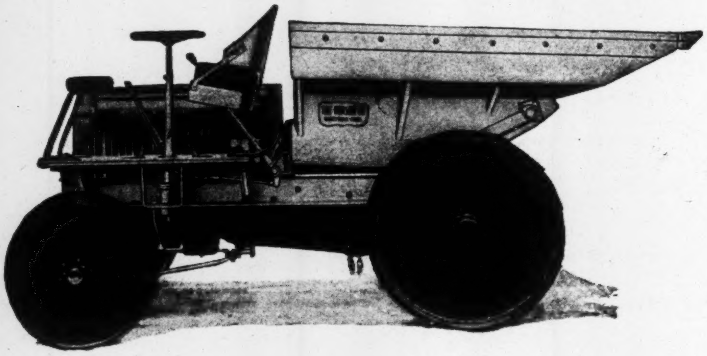Bucyrus, Ohio